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Inter. (Part-II)-A- 2015

Roll No.__________ *to be filled in by the candidate.*

(For all sessions)

Paper Code	8	1	9	1

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. Who recongnized the term function to describe the dependence of one quantity on other?

(A) Euler (B) Leibniz (C) Langrange (D) Bohr

2. If $f(x)=x^2$, then domain of f is:

(A) real No (B) integer (C) rational No (D) irrational

3. $\lim\limits_{x\to a}\frac{f(x)-f(a)}{x-a}$ is equal to:

(A) $f'(x)$ (B) $f'(a)$ (C) $f'(2)$ (D) $f'(0)$

4. If $f(x)=x^{\frac{2}{3}}$, then $f'(8)$ is equal to:

(A) $\frac{1}{2}$ (B) $\frac{2}{3}$ (C) $\frac{1}{3}$ (D) 3

5. The derivative of $\sqrt{x}$ at $x=a$ is:

(A) $\frac{1}{2\sqrt{a}}$ (B) $2\sqrt{a}$ (C) $\frac{1}{\sqrt{a}}$ (D) $\frac{-1}{2\sqrt{a}}$

6. $\frac{d}{dx}(\sec x)$ is equal to:

(A) $\sec x\ \tan x$ (B) $-\sec x\ \tan x$ (C) $\sec^2 x$ (D) $\operatorname{cosec}^2 x$

7. $\frac{1}{1+x^2}$ is derivative of:

(A) $\sin^{-1}x$ (B) $\sec^{-1}x$ (C) $\tan^{-1}x$ (D) $\cot^{-1}x$

8. $\int x^n dx=$ for $n\neq -1$.

(A) $\frac{x^{n+1}}{n}+c$ (B) $\frac{x^{n-1}}{n-1}+c$ (C) $\frac{x^{n+1}}{n+1}+c$ (D) $n\,x^{n-1}+c$

9. $\int \ell nx\,dx$ is equal to:

(A) $x\ell nx-x$ (B) $x-x\ell nx$ (C) $x\ell nx+x$ (D) $\frac{1}{x}\ell nx$

10. $\int x\left(\sqrt{x}+1\right)dx$ is equal to:

(A) $\frac{2}{3}x^{3/2}+c$ (B) $\frac{2}{5}x^{5/2}+\frac{x^2}{2}+c$ (C) $\frac{2}{5}x^{5/2}+c$ (D) $x^{3/2}+x+c$

11. $\int a^x\,dx$ is equal to:

(A) $\frac{a^x}{\ell na}+c$ (B) $\frac{\ell na}{a^x}+c$ (C) $\frac{1}{a^x\ell na}$ (D) $a^x\ell na+c$

12. $\int_1^2\left(x^2+1\right)dx$ is equal to:

(A) $\frac{3}{10}$ (B) 2 (C) $\frac{10}{3}$ (D) 0

13. $\int_{-\pi}^{\pi}\sin x dx$ is equal to:

(A) 1 (B) 0 (C) 2 (D) -1

14. Bisectors of angles of a triangle are:

(A) parallel (B) perpendicular (C) concurrent (D) non-concurrent

15. If $b=0$, then the line $ax+by+c=0$ is parallel to:

(A) $y-axis$ (B) $x-axis$ (C) along $x-axis$ (D) None of these

16. A function which is to be maximized or minimized is called:

(A) subjective function (B) qualitative function (C) objective function (D) quantitative function

17. Comics are the curves obtained by cutting a right circular cone by.

(A) a line (B) a plane (C) sphere (D) two lines

18. The parabola $y^2=4ax$, $a>0$ opens

(A) right (B) left (C) upward (D) downward

19. The unit vector of a vector $\underline{v}$ is:

(A) $\frac{\underline{v}}{|\underline{v}|}$ (B) $\underline{v}|\underline{v}|$ (C) $\frac{|\underline{v}|}{\sqrt{|\underline{v}|}}$ (D) $\frac{\underline{v}}{|\underline{v}|^2}$

20. The angle between the vectors $2\hat{i}+3\hat{j}+\hat{k}$ and $2\hat{i}-\hat{j}-\hat{k}$ is:

(A) 30^0 (B) 45^0 (C) 60^0 (D) 90^0

oll No.________ to be filled in by the candidate. **(For all sessions)** | Subject code | 6 | 0 | 1 | 9 |

athematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove the identity $\operatorname{cosec} h^2 x = \coth^2 x - 1$.

ii. Evaluate the limit: $\lim_{x\to\infty}\left(1+\frac{3}{x}\right)^{2x}$.

iii. Differentiate $x^{-3} + 2x^{\frac{-3}{2}} + 3$ w.r.t x.

iv. Find $\frac{dy}{dx}$ if $x^2 + y^2 = a^2$.

v. Differentiate $y = e^{f(x)}$ w.r.t x.

vi. Find $\frac{dy}{dx}$ if $y = \cos^{-1} x$.

vii. Find $\frac{dy}{dx}$ if $x = y \sin y$.

viii. Find $\frac{dy}{dx}$ if $y = x\sqrt{\ell nx}$.

ix. Find $f'(x)$ if $f(x) = e^{\sqrt{x}-1}$.

x. Differentiate $\sinh^{-1}\left(\frac{x}{2}\right)$ w.r.t x.

xi. Write Maclaurins series expension of the function $f(x)$.

xii. Determine the intervals in which $f(x) = 4 - x^2, x \in (-2,2)$ increases or decreases.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Use differential find $\frac{dy}{dx}$ for $x^2 + 2y^2 = 16$.

ii. Evaluate: $\int (x+1)(x-3)\,dx$.

iii. Find: $\int (\ell nx) \times \frac{1}{x} dx$. $(x > 0)$

iv. Evaluate: $\int \sec x \, dx$.

v. Evaluate: $\int (\ell nx)^2 \, dx$

vi. Find $\int \frac{x+2}{\sqrt{x+3}} dx$.

vii. Evaluate: $\int \frac{2a}{x^2 - a^2} dx$. $(x > a)$

viii. Evaluate: $\int_1^2 \frac{x}{x^2+2} dx$.

ix. Find area bounded by the curve $y = 4 - x^2$ and $x - axis$.

x. Solve D.E $\sin y \operatorname{cosec} x \frac{dy}{dx} = 1$.

xi. Graph the solution set of $5x - 4y \le 20$.

xii. Define convex region.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Define $y-$intercept of a line.

ii. Find the slope and inclination of the line joining points $A(-2,4), B(5,11)$.

iii. Find the equation of the line bisecting first and third quadrants.

iv. Find the points of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$.

v. Find the lines represented by $9x^2+24xy+16y^2=0$.

vi. Find the centre and radius of circle $x^2+y^2+12x-10y=0$.

vii. Find focus and vertex of parabola $x^2=-16y$.

viii. Find the centre and foci of ellipse $25x^2+9y^2=225$.

ix. Find the centre and foci of hyperbola $\frac{y^2}{16}-\frac{x^2}{9}=1$.

x. Find the unit vector in the direction of $\vec{v}=2\hat{i}-\hat{j}$.

xi. Find α so that $\left|\alpha\hat{i}+(\alpha+1)\hat{j}+2\hat{k}\right|=3$.

xii. Find the scaler $\propto$ so that the vectors $2\hat{i}+\alpha\hat{j}+5\hat{k}$ and $3\hat{i}+\hat{j}+\alpha\hat{k}$ are perpendicular.

xiii. Find the value of α so that $\alpha\hat{i}+\hat{j}$, $\hat{i}+\hat{j}+3\hat{k}$ and $2\hat{i}+\hat{j}-2\hat{k}$ are coplaner.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) If $f(x)=\frac{2x+1}{x-1}$, then find $f^{-1}(x)$ and verify that $\left(f\,0\,f^{-1}\right)x=x$.

(b) Find $f'(x)$, when $f(x)=(\ell nx)^{\ell nx}$.

6. (a) Show that $\int e^{ax}\sin bx\,dx=\frac{1}{\sqrt{a^2+b^2}}e^{ax}\sin\left(bx-\tan^{-1}\frac{b}{a}\right)+c$.

(b) Find a joint equation of the straight line through the origin and perpendicular to the lines represented by $x^2+xy-6y^2=0$.

7. (a) Evaluate: $\int_1^3\frac{x^2-2}{x+1}dx$.

(b) Maximize $f(x,y)=2x+5y$ subject to the constraints $2y-x\le 8$; $x-y\le 4$; $x\ge 0$, $y\ge 0$.

8. (a) Find the length of the chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

(b) Find the angle between the vectors $\bar{u}=2i-j+k$ and $\vec{v}=-i+j$.

9. (a) Write an equation of parabola with focus (1 , 2) and vertex (3 , 2).

(b) Prove vectorially $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$.

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Inter. (Part-II)-A- 2016

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Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\frac{1}{2}\frac{d}{dx}\left[\tan^{-1}x-\cot^{-1}x\right]=$

(A) $-\frac{1}{1+x^2}$ (B) $\frac{1}{1+x^2}$ (C) $\frac{1}{1-x^2}$ (D) $\frac{-1}{1-x^2}$

2. If $f(x)=\tan^{-1}x$ then $f'(\cot x)=$

(A) $\cos^2 x$ (B) $\sin^2 x$ (C) $\cos ec^2 x$ (D) $\cot^2 x$

3. $\frac{d}{dx}\left[\frac{1}{\sin x}\right]=$

(A) $\frac{1}{\cos x}$ (B) $-\frac{\sin x}{\cos x}$ (C) $\cos ec^2 x$ (D) $-\cos ec\, x\cot x$

4. $\frac{d}{dx}\left(\ell ne^x\right)=$

(A) e^x (B) 1 (C) x (D) $\frac{1}{x}$

5. $\int_{-\infty}^{\infty}\frac{1}{1+x^2}dx=$

(A) π (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

6. $\int_0^{\pi/2}k\cos x\,dx=4$, then $k=$

(A) 5 (B) 4 (C) 2 (D) 0

7. If $g(x)=\frac{1}{x^2}(x\neq 0)$ then $gog(x)$ is equal to:

(A) 1 (B) x^2 (C) x^4 (D) $\frac{1}{x^4}$

8. The function $f(x)=\frac{2+3x}{2x}$ is not continuous at:

(A) $x=-3$ (B) $x=-\frac{2}{3}$ (C) $x=0$ (D) $x=1$

9. $\frac{1}{x}\frac{d}{dx}\left(\sin x^2\right)=$

(A) $2x\cos x^2$ (B) $\cos x^2$ (C) $2x\cos^2 x$ (D) $2\cos x^2$

10. Slope of line is 1(one) and angle made by line with $x-axis =$.

(A) 45^0 **(B)** 30^0 **(C)** 60^0 **(D)** 75^0

11. The solution set of $x<4=$

(A) $0<x<4$ **(B)** $10<x<15$ **(C)** $-\infty<x<4$ **(D)** $4<x<\infty$

12. Mid-poit of line segment joining foci of ellips is called its =

(A) centre **(B)** vertex **(C)** directrix **(D)** major-axis

13. A circle touches the two axis at (a , 0) and (0 , a) then centre of circle is =

(A) (- a , a) **(B)** (a , -a) **(C)** (a , a) **(D)** (- a , - a)

14. What is the value of $[\underline{a} \ \ \underline{b} \ \ \underline{b}]$ =

(A) 1 **(B)** -1 **(C)** 0 **(D)** 2

15. Which of triples can be direction angles of a single vector = :

(A) 90^0, 90^0, 45^0 **(B)** 0^0, 0^0, 45^0 **(C)** 45^0, 45^0, 90^0 **(D)** 30^0, 30^0, 30^0

16. $\int\frac{\sin 2x}{\sin x}dx=$

(A) $\sin 2x$ **(B)** $2\sin 2x$ **(C)** $\frac{1}{2}\sin x$ **(D)** $2\sin x$

17. $\int\frac{\ell ogx}{x}dx=$

(A) ℓogx **(B)** $\ell og(\ell ogx)$ **(C)** $\frac{(\ell ogx)^2}{2}$ **(D)** $\frac{1}{x}$

18. $\int\tan\frac{\pi}{4}dx=$

(A) $\ell n\left(\sin\frac{\pi}{4}\right)$ **(B)** 1 **(C)** $\sec^2\frac{\pi}{4}$ **(D)** $x\tan\frac{\pi}{4}$

19. $\int\frac{\sin p}{\cos^2 x}dx=$

(A) $\sin p\sec^2 x$ **(B)** $\sin p\tan x$ **(C)** $\cos p\sec^2 x$ **(D)** $\sec^2 x$

20. Centroid is a point which divides each median in ratio =

(A) 2 : 1 **(B)** 1 : 2 **(C)** 1 : 1 **(D)** 3 : 2

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Subject code	6	0	1	9

Mathematics (Essay Type)

Time: 2:30 Hours

Marks: 80

Section -I

2x25=50

2. Write short answers of any eight parts from the following. 2x8=16

i. Prove that $\cosh^2 x - \sinh^2 x = 1$

ii. Evaluate: $\lim_{x\to\pi} \frac{\sin x}{\pi - x}$.

iii. Evaluate: $\lim_{x\to 2} \frac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. Find $\frac{dy}{dx}$ by 1st principle $\sqrt{x+2}$.

v. Differentiate w.r.t x $\frac{a+x}{a-x}$.

vi. Differentiate $x^2 - \frac{1}{x^2}$ w.r.t x^4.

vii. Differentiate w.r.t x $\frac{1}{a}\sin^{-1}\frac{a}{x}$.

viii. Find $\frac{dy}{dx}$ If $y = \frac{x}{\ell nx}$.

ix. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

x. Expand a^x by maclaurin's series.

xi. Define critical point.

xii. Find the interval for which function is increasing and decreasing $f(x) = 4 - x^2$ for $x \in (-2,2)$.

3. Write short answers of any eight parts from the following. 2x8=16

i. Evaluate: $\int x\sqrt{x^2-1}\,dx$.

ii. Evaluate: $\int \frac{\sqrt{y}(y+1)}{y} dy \quad y>0$.

iii. Evaluate: $\int \frac{\cot\sqrt{x}}{\sqrt{x}} dx \quad x>0$.

iv. Find $\int x\cos x\,dx$.

v. Evaluate: $\int e^x\left(\frac{1}{x} + \ell nx\right)dx$.

vi. Define definite integral. Give one example.

vii. Evaluate: $\int_0^{\pi/2} \cos^2\theta \sin\theta\, d\theta$.

viii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$.

ix. Find the area above the $x-axis$ and the curve $y = 5 - x^2$ from $x=-1$ to $x=2$.

x. Find δy and dy of the function defined as $f(x) = x^2$ when $x = 2$ and $dx = 0.01$.

xi. Define vertex of the solution region.

xii. Graph the solution set of the inequality $3x + 7y \geq 21$.

4. Write short answers of any nine parts from the following. 2x9=18

i. Find h such that A (-1 , h) , B (3 , 2) and C (7 , 3) are collinear.

ii. If (x,y) co-ordinates of a point are $(-2,6)$. Find (x,y) transformed co-ordinates if new origin is $o'(-3,2)$.

iii. Three points A (7 , -1) , B (-2 , 2) and C (1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

iv. Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

v. Find acute angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

vi. Show that the line $3x - 2y = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$.

vii. Find the equation of tangent drawn from (0 , 5) to circle $x^2 + y^2 = 16$.

viii. Find focus and vertex of parabola $y = 6x^2 - 1$.

ix. Find an equation of ellipse whose vertices are $(0, \pm 5)$ and ecentricity $3/5$.

x. Find x so that $|xi + (x+1)j + 2k| = 3$.

xi. Find unit vector perpendicular to $\vec{a} = 2i - 6j - 3k$, $\vec{b} = 4i + 3j - k$

xii. Constant force $\vec{F} = 4i + 3j + 5k$ moves an object from (3 , 1 , -2) to (2 , 4 , 6).Find the work done.

xiii. Find a vector of magnitude > parallel to $2i + 3j + 2k$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$.

(b) If $y = a\cos(\ell nx) + b\sin(\ell nx)$ then prove that $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$.

6. (a) Evaluate: $\int \frac{5x+8}{(x+3)(2x-1)} dx$.

(b) Find h such that the points $A(\sqrt{3}, -1)$, $B(0,2)$, $C(h,-2)$ are the vertices of a right triangle with right angle at the vertex A.

7. (a) Find the area between the X-axis and the curve $y = \sqrt{2ax - x^2}$ when $a > 0$.

(b) Find the maximum value of $f(x) = 4x + 6y$ under the constraints

$2x - 3y \le 6$, $2x + y \ge 2$, $2x + 3y \le 12$, $x \ge 0$, $y \ge 0$

8. (a) Find equation of the tangents to the circle $x^2 + y^2 = 2$ parallel to the line $x - 2y + 1 = 0$.

(b) Find the number Z, so that the triangle with vertices A(1, -1 , 0) , B(-2,2,1) and C(0,2, Z) is a right angle triangle with right angle at C.

9. (a) Find an equation of the parabola whose focus is F (-3,4) and directrix is $3x - 4y + 5 = 0$.

(b) Find the value of α so that $\alpha \underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

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iv. Find $\frac{dy}{dx}$ by 1st principle $\sqrt{x+2}$.

v. Differentiate w.r.t x $\frac{a+x}{a-x}$.

vi. Differentiate $x^2 - \frac{1}{x^2}$ w.r.t x^4.

vii. Differentiate w.r.t x $\frac{1}{a}\sin^{-1}\frac{a}{x}$.

viii. Find $\frac{dy}{dx}$ If $y = \frac{x}{\ell nx}$.

ix. Find y_2 if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$.

x. Expand a^x by maclaurin's series.

xi. Define critical point.

xii. Find the interval for which function is increasing and decreasing $f(x) = 4 - x^2$ for $x \in (-2,2)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int x\sqrt{x^2-1}\,dx$.

ii. Evaluate: $\int \frac{\sqrt{y}(y+1)}{y}dy \quad y > 0$.

iii. Evaluate: $\int \frac{\cot\sqrt{x}}{\sqrt{x}}dx \quad x > 0$.

iv. Find $\int x\cos x\,dx$.

v. Evaluate: $\int e^x\left(\frac{1}{x} + \ell nx\right)dx$.

vi. Define definite integral. Give one example.

vii. Evaluate: $\int_0^{\pi/2} \cos^2\theta\sin\theta\,d\theta$.

viii. Solve the differential equation $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$.

ix. Find the area above the $x-axis$ and the curve $y = 5 - x^2$ from $x = -1$ to $x = 2$.

x. Find δy and dy of the function defined as $f(x) = x^2$ when $x = 2$ and $dx = 0.01$.

xi. Define vertex of the solution region.

xii. Graph the solution set of the inequality $3x + 7y \geq 21$.

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i. Find h such that A (-1 , h) , B (3 , 2) and C (7 , 3) are collinear.

ii. If (x, y) co-ordinates of a point are $(-2,6)$. Find (x, y) transformed co-ordinates if new origin is $o'(-3,2)$.

iii. Three points A (7 , -1) , B (-2 , 2) and C (1 , 4) are consecutive vertices of a parallelogram. Find the fourth vertex.

iv. Find the point of intersection of lines $x + 4y - 12 = 0$ and $x - 3y + 3 = 0$

v. Find acute angle between the lines represented by $x^2 - xy - 6y^2 = 0$.

vi. Show that the line $3x - 2y = 0$ is tangent to the circle $x^2 + y^2 + 6x - 4y = 0$.

vii. Find the equation of tangent drawn from (0 , 5) to circle $x^2 + y^2 = 16$.

viii. Find focus and vertex of parabola $y = 6x^2 - 1$.

ix. Find an equation of ellipse whose vertices are $(0, \pm 5)$ and ecentricity $3/5$.

x. Find x so that $|xi + (x+1)j + 2k| = 3$.

xi. Find unit vector perpendicular to $\vec{a} = 2i - 6j - 3k$, $\vec{b} = 4i + 3j - k$

xii. Constant force $\vec{F} = 4i + 3j + 5k$ moves an object from (3 , 1 , -2) to (2 , 4 , 6).Find the work done.

xiii. Find a vector of magnitude > parallel to $2i + 3j + 2k$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{x \to 0} \frac{1 - \cos 2x}{x^2}$.

(b) If $y = a\cos(\ell nx) + b\sin(\ell nx)$ then prove that $x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$.

6. (a) Evaluate: $\int \frac{5x+8}{(x+3)(2x-1)} dx$.

(b) Find h such that the points $A(\sqrt{3}, -1)$, $B(0,2)$, $C(h,-2)$ are the vertices of a right triangle with right angle at the vertex A.

7. (a) Find the area between the X-axis and the curve $y = \sqrt{2ax - x^2}$ when $a > 0$.

(b) Find the maximum value of $f(x) = 4x + 6y$ under the constraints

$2x - 3y \le 6$, $2x + y \ge 2$, $2x + 3y \le 12$, $x \ge 0$, $y \ge 0$

8. (a) Find equation of the tangents to the circle $x^2 + y^2 = 2$ parallel to the line $x - 2y + 1 = 0$.

(b) Find the number Z, so that the triangle with vertices A(1, -1 , 0) , B(-2,2,1) and C(0,2, Z) is a right angle triangle with right angle at C.

9. (a) Find an equation of the parabola whose focus is F (-3,4) and directrix is $3x - 4y + 5 = 0$.

(b) Find the value of α so that $\alpha\underline{i} + \underline{j}$, $\underline{i} + \underline{j} + 3\underline{k}$ and $2\underline{i} + \underline{j} - 2\underline{k}$ are coplaner.

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Inter. (Part-II)-A- 2017

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Mathematics (Objective Type)

Group-I

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1-1. If $f(x)$ is continuous at point $x = a$, then.

(A) $f(a) = \lim_{x\to a} f(x)$ (B) $f(a) = \lim_{x\to 0} f(x)$ (C) $f(0) = \lim_{x\to a} f(x)$ (D) $f(x) = \lim_{x\to a} f(x)$

2. $\lim_{x\to 0} \frac{\sin bx}{\sin ax}$ is equal to:

(A) $-a/b$ (B) $-b/a$ (C) a/b (D) b/a

3. $\frac{d}{dx}(\cos^{-1} x)$ is equal to:

(A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{-1}{\sqrt{1-x^2}}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{-1}{1+x^2}$

4. $\frac{d}{dx}(\sec hx)$ is equal to:

(A) $\sec x \tan x$ (B) $-\sec x \tan x$ (C) $-\sec hx \tanh x$ (D) $\sec hx \tanh x$

5. Let $y = \cos(ax + b)$, then y_2 equals.

(A) ay (B) $-ay$ (C) $a^2 y$ (D) $-a^2 y$

6. The critical value of $f(x) = x^2 - x - 2$ equals.

(A) $\frac{1}{2}$ (B) $\frac{-1}{2}$ (C) 2 (D) -2

7. If $y = \sin^{-1}\sqrt{x}$, then $\frac{dy}{dx}$ equals.

(A) $\frac{1}{2\sqrt{x}\sqrt{1-x^2}}$ (B) $\frac{-1}{2\sqrt{x}\sqrt{1-x^2}}$ (C) $\frac{1}{2\sqrt{x}\sqrt{1-x}}$ (D) $\frac{1}{\sqrt{x}\sqrt{1-x}}$

8. $\int \frac{f'(x)}{f(x)} dx$ equals.

(A) $\ln f'(x)$ (B) $\ln f(x)$ (C) $f(x)$ (D) $f'(x)$

9. $\int \cot x \, dx$ is equal to:

(A) $\ln \sin x$ (B) $\ln \cos x$ (C) $-\ln \sin x$ (D) $-\ln \cos x$

10. $\int \tan^2 x \, dx$ is equal to:

(A) $2\tan x$ (B) $2\tan x + x$ (C) $\tan x + x$ (D) $\tan x - x$

11. $\int e^{ax}\left[af(x) + f'(x)\right]dx$ is equal to:

(A) $e^{ax} f'(x)$ (B) $e^{ax} f(x)$ (C) $e^{ax}.a\ f'(x)$ (D) $e^{ax}.a\ f(x)$

12. $\int_0^1 (3-x)\,dx$ equals:

(A) $3/2$ (B) $2/3$ (C) $5/2$ (D) $2/5$

13. Inclination of line joining two points (-2 , 4) and (5 , 11) equals:

(A) $\pi/3$ (B) $\pi/4$ (C) $\pi/6$ (D) $\pi/2$

14. Two lines represented by $ax^2 + 2hxy + by^2 = 0$ will be perpendicular if:

(A) $h^2 + ab = 0$ (B) $h^2 - ab = 0$ (C) $a - b = 0$ (D) $a + b = 0$

15. Perpendicular distance of point P(6,-1) from line $3x + 4y + 1 = 0$ equals:

(A) 1 (B) 2 (C) 3 (D) 4

16. (0 , 0) lies in the solution set of inequality.

(A) $x + 2y \leq 10$ (B) $x + 2y \geq 10$ (C) $x + 2y \geq 1$ (D) $x - 2y \geq 10$

17. The co-ordinates of vertices of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ equals:

(A) $(0, \pm b)$ (B) $(\pm b, 0)$ (C) $(0, \pm a)$ (D) $(\pm a, 0)$

18. The co-ordinates of centre of circle $x^2 + y^2 - 6x + 4y + 13 = 0$ is equal to:

(A) (-3 , 2) (B) (3 , -2) (C) (3 , 2) (D) (-3 , -2)

19. Vector triple product of three non zero vectors $\underline{a}, \underline{b}$ and $\underline{c}$ is denoted by:

(A) $\underline{a} \times (\underline{b} \times \underline{c})$ (B) $\underline{a}.(\underline{b} \times \underline{c})$ (C) $\underline{a}.(\underline{b} + \underline{c})$ (D) $\underline{a}.(\underline{b} - \underline{c})$

20. $\left[2\ \underline{k}\ \underline{j}\ \underline{i}\right]$ is equal to:

(A) 1 (B) -1 (C) -2 (D) 2

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Roll No._________ *to be filled in by the candidate.* **(For all sessions)**

Mathematics (Essay Type) Group-I

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\lim_{x\to 2}\frac{\sqrt{x}-\sqrt{2}}{x-2}$.

ii. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$ w.r.t x.

iii. Find $\frac{dy}{dx}$, when $y=\sqrt{x+\sqrt{x}}$.

iv. Differentiate $x^2\sec 4x$ w.r.t x.

v. Find $\frac{dy}{dx}$, if $x=y\sin y$.

vi. Find $f'(x)$ if $f(x)=x^2\ell n\sqrt{x}$.

vii. Find y_2 If $y=\cos^3 x$.

viii. Find $\frac{dy}{dx}$ If $y=xe^{\sin x}$.

ix. Apply maclaurin's series expansion to prove that $e^x=1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+.........$

x. Discuss continuity of function $f(x)\begin{cases}2x+5 & if\ x\le 2\\ 4x+1 & if\ x>2\end{cases}$ at $x=2$.

xi. Determine the function $f(x)=x^3+x$ as an even or odd function.

xii. Determine the intervals in which $f(x)=\cos x : x\in\left(-\pi/2,\ \pi/2\right)$ is increasing or decreasing function.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\frac{e^{2x}+e^x}{e^x}dx$.

ii. Evaluate: $\int\cos 3x\sin 2x\,dx$.

iii. Evaluate: $\int\frac{x+b}{\left(x^2+2bx+c\right)^{1/2}}dx$.

iv. Evaluate: $\int e^{-x}(\cos x-\sin x)\,dx$.

v. Evaluate: $\int_0^3\frac{1}{x^2+9}dx$.

vi. Evaluate: $\int_2^{\sqrt{5}}x\sqrt{x^2-1}\,dx$.

vii. What is the linear programming?

viii. Solve the differentional equation $\frac{1}{x}\frac{dy}{dx}=\frac{\left(1+y^2\right)}{2}$.

ix. Using differentional, find $\frac{dy}{dx}$ in the equation $x^2+2y^2=16$.

x. Using differentional to find the value of $\sqrt[4]{17}$.

xi. Find the area bounded by $\cos x$ function from $x=\frac{-\pi}{2}$ to $x=\frac{\pi}{2}$.

xii. Graph the solution set of the linear inequality $x+y\ge 5$ by shading.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find co-ordinates of the point that divides the join of A(-6,3) and B(5,-2) in the ratio 2:3.

ii. Find the slope and inclination of the line joining the points (4,6) and (4,8).

iii. Convert $2x-4y+11=0$ in normal form.

iv. Find an equation of the line through the point (2,-9) and intersection of the lines $2x+5y-8=0, 3x$-

v. Find whether the point (5,8) lies above or below the line $2x-3y+6=0$.

vi. Find the centre and radius of the circle $5x^2+5y^2+14x+12y-10=0$.

vii. Determine whether the point P(-5,6) lies outside, on, or inside the circle $x^2+y^2+4x-6y-12=0$.

viii. Find focus and vertex of parabola $y^2=-8(x-3)$.

ix. Find foci and eccentricity of the ellipse $25x^2+9y^2=225$.

x. Find direction cosines of the vector $\underline{r}=x\underline{i}+y\underline{j}+z\underline{k}$.

xi. Find a vector of length 5, in the direction opposite to the vector $\underline{v}=\underline{i}-2\underline{j}+3\underline{k}$.

xii. If $\underline{a}+\underline{b}+\underline{c}=0$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

xiii. Find the value of α, so that the vectors $\alpha\underline{i}+\underline{j}$, $\underline{i}+\underline{j}+3\underline{k}$ and $2\underline{i}+\underline{j}-2\underline{k}$ are coplaner.

Section -II

Note: Attempt any three questions from the following. **10x3=**

5. (a) Evaluate: $\lim_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$.

(b) If $x=\sin\theta$, $y=\sin(m\theta)$ then prove that $(1-x^2)y_2-xy_1+m^2y=0$.

6. (a) Evaluate: $\int\dfrac{\sqrt{2}}{\sin x+\cos x}dx$.

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the $x-$ and $y-$intercepts of each is 3.

7. (a) Evaluate: $\int_{-1}^{5}|x-3|dx$.

(b) Minimize $z=3x+y$ subject to the constraints $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$.

8. (a) Show that the lines $3x-2y=0$ and $2x+3y-13=0$ are tangent to the circle $x^2+y^2+6x-4y=0$.

(b) Prove that, by vector method $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$.

9. (a) Find centre, foci and vertices of the hyperbola $\dfrac{(x-1)^2}{2}-\dfrac{(y-1)^2}{9}=1$

(b) Find volume of the tetrahedron whose vertices are A(2,1,8) , B(3,2,9) , C(2,1,4) and D(3,3,0).

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Inter. (Part-II)-A- 2017

Roll No.__________ to be filled in by the candidate.

(For all sessions)

Paper Code	8	1	9	2

Mathematics (Objective Type)

Group-II

Time: 30 Minutes

Marks: 20

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. $\tan hx$ is equal to:

(A) $\frac{e^{-x}+e^{x}}{e^{x}-e^{-x}}$ (B) $\frac{e^{x}-e^{-x}}{e^{x}+e^{-x}}$ (C) $\frac{e^{-x}-e^{x}}{e^{x}+e^{-x}}$ (D) $\frac{e^{-x}+e^{x}}{2}$

2. $\lim_{x\to 0}\frac{x}{\tan x}$ is equal to:

(A) 0 (B) 1 (C) ∞ (D) $\frac{1}{2}$

3. $\lim_{x\to\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}}$ is equal to:

(A) e (B) $\sqrt{e}$ (C) 0 (D) $\frac{1}{e}$

4. $\frac{d}{dx}\left(x^3+4\right)^{\frac{1}{3}}$ is equal to:

(A) $x\left(x^3+4\right)^{\frac{-3}{2}}$ (B) $\left(x^3+4\right)^{\frac{-2}{3}}2x^2$ (C) $x^2\left(x^3+4\right)^{\frac{-2}{3}}$ (D) $\left(x^3+4\right)^{\frac{4}{3}}$

5. If $f(x)=\frac{2}{x^3}$ then $f'(2)$ is equal to:

(A) $\frac{3}{8}$ (B) $\frac{5}{8}$ (C) $\frac{1}{4}$ (D) $\frac{-3}{8}$

6. $\frac{d}{dx}fog(x)=$

(A) $f'[g(x)]g'(x)$ (B) $f[g(x)]g'(x)$ (C) $f'[g'(x)]$ (D) $f'(x).g'(x)$

7. $\frac{d}{dx}a^{\lambda x}=$

(A) $\lambda a^{\lambda x}\ell na$ (B) $a^{\lambda x}\ell na$ (C) $\frac{a^{\lambda x}}{\ell na}$ (D) $\frac{a^{\lambda x}}{\lambda}$

8. $\int \ell nx\,dx=$

(A) $x-x\ell nx+c$ (B) $x\ell nx+x+c$ (C) $\frac{1}{x}+c$ (D) $x\ell nx-x+c$

9. $\int \sin 2x\,dx=$

(A) $\frac{-\cos 2x}{2}$ (B) $\frac{\cos 2x}{2}$ (C) $2\cos 2x$ (D) $-2\cos 2x$

10. $\int \frac{1}{x^2+9} dx =$

(A) $\frac{1}{3}\sin^{-1}\frac{x}{3}$ (B) $\frac{1}{3}\tan^{-1}\frac{x}{3}$ (C) $\frac{1}{3}\cos^{-1}\frac{x}{3}$ (D) $\tan^{-1}\frac{x}{3}$

11. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos x \, dx =$

(A) 0 (B) 1 (C) 2 (D) -2

12. $ydx + xdy = 0$

(A) $\frac{x}{y} = c$ (B) $\frac{y}{x} = c$ (C) $xy = c$ (D) $x + y = c$

13. If $ax^2 + 2hxy + by^2 = 0$ is homogeneous equation then pair of lines are real and coincident if:

(A) $h^2 - ab > 0$ (B) $h^2 - ab < 0$ (C) $h^2 - ab = 0$ (D) $h + a + b = 0$

14. Two lines having slope m_1 and m_2 are perpendicular if:

(A) $m_1 = -m_2$ (B) $1 + m_1 m_2 = 0$ (C) $m_1 m_2 = 1$ (D) $m_1 m_2 = 0$

15. The point (3,-8) lies in the quadrant.

(A) I (B) II (C) III (D) IV

16. If $x = -3$ satisfies.

(A) $x + 3 > 2$ (B) $x + 3 > -2$ (C) $3x > 0$ (D) $x + 2 > 5$

17. If $x^2 + y^2 + 2gx + 2fy + c = 0$ represents equation of circle then radius $r =$.

(A) $\sqrt{g^2 + f^2 + c}$ (B) $\sqrt{g^2 - f^2 - c}$ (C) $\sqrt{g^2 - f^2 + c}$ (D) $\sqrt{g^2 + f^2 - c}$

18. If e is eccentricity then conic represents ellipse.

(A) $e = 0$ (B) $e = 1$ (C) $e > 1$ (D) $e < 0$

19. If $\vec{v} = -\frac{\sqrt{3}}{2} i - \frac{1}{2} j$, then $|\vec{v}| =$

(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) 4

20. The value of $i.i \times k =$

(A) 0 (B) -1 (C) j (D) 1

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Roll No.________ to be filled in by the candidate. **(For all sessions)**

Mathematics (Essay Type) Group-II

Time: 2:30 Hours **Marks: 80**

Section -I

2x25=50

2. Write short answers of any eight parts from the following. **2x8=16**

i. Write down domain and range of $y=\sec x$.

ii. Evaluate: $\lim_{h\to 0}(1+2h)^{\frac{1}{h}}$.

iii. Evaluate: $\lim_{x\to 2}\frac{\sqrt{x}-\sqrt{2}}{x-2}$.

iv. If $y=\frac{1}{x^2}$, then find $\frac{dy}{dx}$ at $x=-1$.

v. Differentiate $\left(\sqrt{x}-\frac{1}{\sqrt{x}}\right)^2$.

vi. Differentiate $x^2.\sec 4x$.

vii. Differentiate $\sin x$ w.r.t $\cot x$.

viii. Find $\frac{dy}{dx}$ If $y=\sqrt{x+\sqrt{x}}$.

ix. Find $\frac{dy}{dx}$ If $y=\sinh^{-1}(x^3)$.

x. Find $f'(x)$ If $f(x)=\ell n\left(\sqrt{e^{2x}+e^{-2x}}\right)$.

xi. Find $\frac{dy}{dx}$ If $xy+y^2=2$.

xii. Find y_2 If $y=x^2e^x$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\frac{1}{1+\cos x}dx$.

ii. Using differential, find $\frac{dx}{dy}$ if $xy-\ell nx=c$.

iii. Evaluate: $\int\frac{\left(1-\sqrt{x}\right)^2}{\sqrt{x}}dx$, $(x>0)$.

iv. Evaluate: $\int\sec x dx$.

v. Evaluate: $\int\frac{\sec^2 x}{\sqrt{\tan x}}dx$.

vi. Evaluate: $\int e^{2x}(-\sin x+2\cos x)dx$.

vii. Evaluate: $\int_1^2\frac{x}{x^2+2}dx$.

viii. Evaluate: $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}}\cos t\, dt$.

ix. Solve the differential equation $\frac{dy}{dx}=\frac{1-x}{y}$.

x. Solve the differential equation $\sin y \operatorname{cosec} x\frac{dy}{dx}=1$

xi. What is an optimal solution?

xii. Graph the solution region of linear inequalities $x+y\le 5$, $y-2x\le 2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find the co-ordinates of point that divide the join of A(-6,3) and B(5,-2) in 2:3.

ii. The two points P(3,2) , O'(1,3) are in $xy-$ coordinates. Find P in $xy-$ coordinate system.

iii. Write the equation of line in two intercept form.

iv. Find the equation of line passing through A(-6,5) having slope 7.

v. Find the slope of the line $2x+y-3=0$.

vi. Find the radius of the circle $x^2+y^2+12x-10y=0$.

ii. Find the centre and radius of the circle $x^2+y^2=5$.

iii. Write the standard equation of Hyperbola.

x. Find the focus and the directrix of parabola $y^2=-12x$.

x. Find a vector whose magnitude is 4 and is parallel to $2\vec{i}-3\vec{j}+6\vec{k}$.

i. Find α so that $\left|\alpha\vec{i}+(\alpha+1)\vec{j}+2\vec{k}\right|=3$.

ii. Find $\vec{b}\times\vec{a}$, where $\vec{a}=3\vec{i}-2\vec{j}+\vec{k}$, $\vec{b}=\vec{i}+\vec{j}$.

ii. find the value of $3\vec{j}.\vec{k}\times\vec{i}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Find the : $\lim_{x\to 0}\frac{1-\cos px}{1-\cos qx}$.

(b) If $y=\sqrt{\tan x+\sqrt{\tan x+\sqrt{\tan x+\ldots\ldots\infty}}}$ then prove that $(2y-1)\frac{dy}{dx}=\sec^2 x$.

6. (a) Evaluate: $\int\tan^4 x dx$.

(b) Find equations of two parallel lines perpendicular to $2x-y+3=0$ such that the product of the $x-$intercept and $y-$intercept of each is 3.

7. (a) Evaluate: $\int_0^{\frac{\pi}{4}}\frac{\cos\theta+\sin\theta}{2\cos^2\theta}\,d\theta$.

(b) Graph feasible region and find corner points of $2x+y\le 10$, $x+4y\le 12$, $x+y\le 10$, $x\ge 0$, $y\ge 0$.

8. (a) Find the length of chord cut off from the line $2x+3y=13$ by the circle $x^2+y^2=26$.

(b) Find two vectors of length 2 parallel to the vector $\underline{v}=2\underline{i}-4\underline{j}+4\underline{k}$.

9. (a) Find the equation of ellipse with foci $(\pm 3\sqrt{3},0)$ and vertices $(\pm 6,0)$.

(b) If $\underline{a}+\underline{b}+\underline{c}=\underline{0}$, then prove that $\underline{a}\times\underline{b}=\underline{b}\times\underline{c}=\underline{c}\times\underline{a}$.

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Inter. (Part-II)-A- 2018

Roll No.______ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given. Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1.1. Point of concurrency of medians of a triangle is called:

(A) orthocentre (B) in-centre (C) ex-centre (D) centroid

2. The lines represented by $ax^2 + 2hxy + by^2 = 0$, are real and coincident if:

(A) $h^2 > ab$ (B) $h^2 = ab$ (C) $h^2 < ab$ (D) $h^2 = a + b$

3. Equation of the line bisecting the first and third quadrant is:

(A) $y = x$ (B) $y = -x$ (C) $y = x + c$ (D) $xy = c$

4. Slope of the line which is perpendicular to the line $2x - 4y + 11 = 0$ is:

(A) $\frac{1}{2}$ (B) $-\frac{1}{2}$ (C) 2 (D) -2

5. Point (1 , 2), satisfies the inequality.

(A) $2x + y > 5$ (B) $2x + y \geq 5$ (C) $2x + y < 3$ (D) $2x + y < 5$

6. The centre of the circle $(x+3)^2 + (y-2)^2 = 16$, equals.

(A) $(3,-2)$ (B) $(-3,2)$ (C) $(3,2)$ (D) $(-3,-2)$

7. The eccentricity of $\frac{y^2}{4} - x^2 = 1$, equals.

(A) $\frac{2}{\sqrt{5}}$ (B) $\frac{-2}{\sqrt{5}}$ (C) $\frac{\sqrt{5}}{2}$ (D) $\frac{-\sqrt{5}}{2}$

8. $2i.(3j \times k)$ is equl to:

(A) 0 (B) 2 (C) 4 (D) 6

9. $\cos\theta$, equals to:

(A) $\hat{a} . \hat{b}$ (B) $|\bar{a} \times \bar{b}|$ (C) $\hat{a} \times \hat{b}$ (D) $\frac{|\bar{a} \times \bar{b}|}{|\bar{a}|}$

10. If $f(x) = \sqrt{x+4}$, then $f(x^2+4)$ is equal to:

(A) $x^2 - 8$ (B) $\sqrt{x^2 - 8}$ (C) $\sqrt{x^2 + 8}$ (D) $x^2 + 8$

11. $\underset{x\to 0}{\ell t} \frac{\sin 7x}{x}$ is equal to:

(A) 1 (B) 7 (C) $\frac{1}{7}$ (D) 0

12. $\frac{d}{dx}\cos^2 x$ is equal to:

(A) $-\sin^2 x$ (B) $2\sin x$ (C) $2\sin x\cos x$ (D) $-2\cos x\sin x$

13. $1+x+\frac{x^2}{\underline{|2}}+\frac{x^3}{\underline{|3}}+\frac{x^4}{\underline{|4}}+\ldots\ldots$ is Maclaurin series of:

(A) e^x (B) $\sin x$ (C) $\cos x$ (D) $\ell n(1+x)$

14. If $x = at^2,\ y = 2at$, then $\frac{dy}{dx}$ is equal to:

(A) t (B) $\frac{1}{t}$ (C) t^2 (D) $\frac{1}{t^2}$

15. $\frac{d}{dx}\left(\frac{1}{ax+b}\right)$ is equal to:

(A) $ax+b$ (B) $\frac{-1}{(ax+b)^2}$ (C) $\frac{-a}{(ax+b)^2}$ (D) $\ell n(ax+b)$

16. If $y = \sin 3x$, then y_2 is equal to:

(A) $9\sin 3x$ (B) $-9\sin 3x$ (C) $9\cos 3x$ (D) $-9\cos 3x$

17. $\int_0^1 \frac{1}{\sqrt{1-x^2}}dx$ is equal to:

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{6}$

18. Solution of the differential equation $\frac{dy}{dx} = \cos x$, is:

(A) $y = \sin x + c$ (B) $y = -\sin x + c$ (C) $y = \cos x + c$ (D) $y = \ell n(\sin x) + c$

19. $\int e^{\tan x}(\sec^2 x)dx$ is equal to:

(A) $e^{\tan x} + c$ (B) $e^x.\tan x + c$ (C) $e^x.\sec x + c$ (D) $e^{\cot x} + c$

20. $\int_0^2 (x^2+1)dx$ is equal to:

(A) $\frac{3}{10}$ (B) $\frac{14}{3}$ (C) $\frac{5}{3}$ (D) $\frac{8}{3}$

Roll No.________ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Prove the identity $\operatorname{sech}^2 x = 1 - \tanh^2 x$.

ii. Find $f^{-1}(x)$ if $f(x) = 3x^3 + 7$.

iii. Evaluate $\lim_{x\to\pi} \frac{\sin x}{\pi - x}$.

iv. Differentiate w.r.t x, $y = \frac{2x-1}{\sqrt{x^2+1}}$.

v. Find $\frac{dy}{dx}$, if $xy + y^2 = 2$.

vi. Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

vii. Differentiate $\cos^{-1}\left(\frac{x}{a}\right)$ w.r.t x.

viii. Differentiate $(\ln x)^x$ w.r.t x.

ix. Find $f'(x)$ if $f(x) = x^3 e^{\frac{1}{x}}$.

x. Find $\frac{dy}{dx}$, if $y = x\sqrt{\ln x}$.

xi. Find y_2, if $y = \sqrt{x} + \frac{1}{\sqrt{x}}$

xii. Determine the interval in which function is increasing or decreasing

for the mentioned domain. $f(x) = \cos x : x \in \left(-\pi/2, \pi/2\right)$

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int x\left(\sqrt{x}+1\right)dx$.

ii. Evaluate: $\int \frac{1-x^2}{1+x^2}dx$.

iii. Evaluate: $\int \frac{-2x}{4-x^2}dx$.

iv. Evaluate: $\int e^x\left(\frac{1}{x} + \ln x\right)dx$.

v. Evaluate: $\int \frac{2x}{1-\sin x}dx$.

vi. Evaluate: $\int_{-1}^{1}\left(x^{\frac{1}{3}} + 1\right)dx$.

vii. Define the definite integral.

viii. Solve the differential equation $ydx + xdy = 0$.

ix. Define the corner point.

x. Graph the solution set of linear inequality $2x + y \le 6$.

xi. Find δy and dy in $y = x^2 + 2x$, when x changes from 2 to 1.8.

xii. Find the area between the $x-$axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find h such that $A(-1,h)$, $B(3,2)$ and $C(7,3)$ are collinear.

ii. Find the centroid of the triangle having vertices $(-2,3)$, $(-4,1)$ and $(3,5)$.

iii. Find an equation of the line through $(-5,-3)$ and $(9,-1)$.

iv. Find the lines represented by the homogeneous equation $3x^2+7xy+2y^2=0$.

v. Find measure of the angle between the lines represent by $x^2-xy-6y^2=0$.

vi. Find the equation of circle with centre $(\sqrt{2},-3\sqrt{3})$ and radius $2\sqrt{2}$.

vii. Find the condition that the line $y=mx+c$ may touch the circle $x^2+y^2=a^2$.

viii. Derive equation of ellipse in standard form.

ix. Find centre and foci of the $x^2-y^2=9$.

x. Let $\underline{U}=\underline{i}+2\underline{j}-\underline{k}$ and $\underline{V}=3\underline{i}-2\underline{j}+2\underline{k}$ find $|\underline{U}+2\underline{V}|$.

xi. Find α, so that $|\alpha\underline{i}+(\alpha+1)\underline{j}+2k|=3$.

xii. Find a vector perpendicular to each of the vectors $\underline{a}=2\underline{i}+\underline{j}+\underline{k}$ and $\underline{b}=4\underline{i}+2\underline{j}-\underline{k}$.

xiii. Find the value of $2\underline{i}\times 2\underline{j}.\underline{k}$.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Evaluate: $\lim_{\theta\to 0}\dfrac{\tan\theta-\sin\theta}{\sin^3\theta}$.

(b) Show that $\dfrac{dy}{dx}=\dfrac{y}{x}$ if $\dfrac{y}{x}=\tan^{-1}\dfrac{x}{y}$.

6. (a) Evaluate: $\int\sqrt{x^2+4}\,dx$.

(b) Find the lines represented by equation. Also find measure of

the angle between them. $2x^2+3xy-5y^2=0$.

7. (a) Evaluate: $\int_{1/8}^{1}\dfrac{\left(x^{1/3}+2\right)^2}{x^{2/3}}dx$.

(b) Minimize $z=3x+y$ subject to the constraints $3x+5y\geq 15$, $x+6y\geq 9$, $x\geq 0$, $y\geq 0$.

8. (a) Find an equation of parabola if focus is $(-3,1)$, directrix $y=1$.

(b) Use vectors to prove that the diagonals of a parallelogram bisect each other.

9. (a) Find the centre, foci, eccentricity, vertices and directrices of $9x^2+y^2=18$.

(b) Prove that $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$ by using vector method.

☆☆☆ *Inter. (Part-II)-A- 2019*

Roll No.______ to be filled in by the candidate.	(For all sessions)	Paper Code	8	1	9	5

Mathematics (Objective Type)

Time: 30 Minutes **Marks: 20**

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & D to each question are given.Which answer you consider correct, fill the corresponding circle A,B,C or D given in front of each question with Marker or pen ink on the answer sheet provided.

1-1. If a line "ℓ" intersect $x-axis$ at $(a,0)$, then "a" is called ______ of line "ℓ".

(A) y-intercept (B) $x-$intercept (C) slope (D) inclination

2. $y=mx+c$ is______form of equaion of line:

(A) point slope (B) intercept (C) normal (D) slope intercept

3. An equaion of line bisecting I and III quadrant is:

(A) $x=y$ (B) $x=-y$ (C) $x+2y=0$ (D) $x-2y=0$

4. $x=0$ is the solution of the inequality.

(A) $2x+1>0$ (B) $2x+1<0$ (C) $2x+1\le 0$ (D) $2x-1<0$

5. The centre of circle $(x+1)^2+(y-2)^2=26$ is:

(A) (1 , 2) (B) (-1 , 2) (C) (-1 , -2) (D) (1 , -2)

6. The equation of directrix of the parabola $x^2=4ay$ is:

(A) $x=a$ (B) $x=-a$ (C) $y=-a$ (D) $y=a$

7. The centre of Ellipse $\frac{x^2}{4}+\frac{y^2}{1}=16$ is:

(A) (4 , 1) (B) (1 , 4) (C) (-1 , 4) (D) (0 , 0)

8. If $\underline{U}$ is any vector, then $\hat{\underline{U}}=$

(A) $\frac{|\underline{U}|}{\underline{U}}$ (B) $\frac{\underline{U}}{|\underline{U}|}$ (C) $\frac{-\underline{U}}{|\underline{U}|}$ (D) $\underline{U}\cdot|\underline{U}|$

9. If $2\underline{i}+\alpha\,\underline{j}+5\underline{k}$ and $3\underline{i}+\underline{j}+\alpha\,\underline{k}$ are perpendicular, then $\alpha=$

(A) 0 (B) 1 (C) -1 (D) 2

10. The domain of $g(x)=2x-5$ is:

(A) IR (B) the set of positive No.

(C) The set of negative real No. (D) The set of non-negative real No.

11. $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^{\frac{n}{2}} =$

(A) e (B) e^2 (C) $e^{\frac{1}{2}}$ (D) e^3

12. $\frac{d}{dx}(x-5)(3-x)=$

(A) $2x+8$ (B) $-2x+8$ (C) $2x-8$ (D) $x+8$

13. If $3x+4y+7=0$, then $\frac{dy}{dx}=$

(A) $\frac{3}{4}$ (B) $\frac{4}{3}$ (C) $\frac{-4}{3}$ (D) $\frac{-3}{4}$

14. $\frac{d}{dx}(\sec x)=$

(A) $\sec x \tan x$ (B) $\sec x$ (C) $co\sec x$ (D) $-\sec x \tan x$

15. If $f(x)=\sin x$, then $f'(0)=$

(A) 0 (B) 1 (C) -1 (D) 2

16. Differential of y is denoted by:

(A) dy' (B) $\frac{dy}{dx}$ (C) dy (D) dx

17. $\int \frac{1}{1+x^2} e^{\tan^{-1}x} dx =$

(A) $e^{\sec x}+c$ (B) $e^{\tan x}+c$ (C) $e^{-\tan x}+c$ (D) $e^{\tan^{-1}x}+c$

18. $\int_1^e \ell nx\, dx =$

(A) -1 (B) 0 (C) 1 (D) e

19. The order of differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-3x=0$ is:

(A) 2 (B) 1 (C) 0 (D) 3

20. If a line "ℓ" is parallel to $x-axis$, then inclination=

(A) 90^0 (B) 0^0 (C) 30^0 (D) 45^0

Roll No. ________ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate the limit $\lim_{x\to a}\frac{x^n-a^n}{x^m-a^m}$.

ii. Discuss the continuity of $f(x)=\frac{x^2-9}{x-3}$ if $x\neq 3$.

iii. Find $\frac{dy}{dx}$ if $x^2-4xy-5y=0$.

iv. Prove that $\frac{d}{dx}\cot^{-1}x=\frac{-1}{1+x^2}$.

v. Find $\frac{dy}{dx}$ if $y=(x+1)^x$.

vi. Find y_2 If $x^2+y^2=a^2$.

vii. Find $\frac{dy}{d\theta}$ if $y=(\sin 2\theta-\cos 3\theta)^2$.

viii. Differentiate $\sin^2 x$ w.r.t $\cos^4 x$.

ix. Find the Maclarin Series for $f(x)=\cos x$.

x. Find $f'(x)$ if $f(x)=\frac{e^x}{e^x+1}$.

xi. Express Area "A" of a circle as a function of its circumference "C".

xii. Determine the intervals for which $f(x)$ is decreasing and increasing $f(x)=\cos x; x\in\left(\frac{-\pi}{2},\frac{\pi}{2}\right)$.

3. Write short answers of any eight parts from the following. **2x8=16**

i. Evaluate: $\int\left(\sqrt{x}+\frac{1}{\sqrt{x}}\right)dx$, $(x>0)$.

ii. Evaluate: $\int\sqrt{1-\cos 2x}\,dx$, $(1-\cos 2x>0)$.

iii. Evaluate: $\int(\ell nx)\times\frac{1}{x}\,dx$, $(x>0)$.

iv. Evaluate: $\int x\sin x\cos x\,dx$ by parts.

v. Evaluate: $\int\tan^3 x\sec x\,dx$.

vi. Evaluate: $\int\frac{e^{m\tan^{-1}x}}{(1+x^2)}dx$.

vii. Define corner point or vertex.

viii. Define feasible region.

ix. Evaluate: $\int_{-1}^{3}(x^3+3x^2)dx$.

x. Evaluate: $\int_{1}^{2}\frac{x}{x^2+2}dx$.

xi. Find δy and dy of the function defined as $f(x)=x^2$, when $x=2$ and $dx=0.01$.

xii. Use differentials to approximate the value of $\sqrt[4]{17}$.

4. Write short answers of any nine parts from the following. **2x9=18**

i. Find the points trisecting the join of A(-1,4) and B(6,2).

ii. Define inclination and slope of a line.

iii. Derive slope-intercept form of equation of straight line.

iv. Find the area of the triangular region whose vertices are A(5,3) B(-2,2) C(4,2).

v. Find equations of lines represented by $20x^2+17xy-24y^2=0$.

vi. Find focus and directrix of the parabola $x^2=-16y$.

vii. Write an equaion of parabola with focus (2,5) and directrix $y=1$.

viii. Find an equation of ellipse having centre (0,0) focus (0,-3) vertex(0,4).

ix. Find centre and foci of the ellipse $x^2+4y^2=16$.

x. Find unit vector in the direction of vector $\vec{v}=\frac{1}{2}\hat{i}+\frac{\sqrt{3}}{2}\hat{j}$.

xi. Define position vector.

xii. Find a vector whose magnitude is 2 and parallel to $-\hat{i}+\hat{j}+\hat{k}$.

xiii. Write vector triple product and scalar triple product.

Section -II

Note: Attempt any three questions from the following. **10x3=30**

5. (a) Prove that : $\lim_{x\to 0}\frac{a^x-1}{x}=\ell og_e^{\,a}$.

(b) Show that $\frac{dy}{dx}=\frac{y}{x}$ if $\frac{y}{x}=\tan^{-1}\frac{x}{y}$.

6. (a) Evaluate the integral: $\int e^x\left(\frac{1+\sin x}{1+\cos x}\right)dx$.

(b) Find k so that the line joining the points A(7,3) , B(k,-6) and the line joining the points C(-4,5), D(-6,4) are perpendicular.

7. (a) Find the area bounded by the curve $y=x(x-1)(x+1)$ and the $x-$axis

(b) Find the corner points of the feasible region intersected by the lines:

$$2x+y\le 8\ ;\ x\ge 0$$
$$x+2y\le 14\ ;\ y\ge 0$$

8. (a) Find equations of the circle of radius 2 and tangent to the line $x-y-4=0$ at A(1,-3).

(b) Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side and half as long.

9. (a) Find Eccentricity foci and directrices of hyperbola $4x^2-8x-y^2-2y-1=0$.

(b) Find moment about A(1,1,1) of resultant of the concurrent forces $i-2j$, $3i+2j-k$, $5j+2k$ where P(2,0,1) is their point of concurrency.

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Roll No. _to be filled in by the candidate._

Inter. (Part-II)-A-2022

Mathematics (Objective Type)

(For all Sessions)

Paper Code 8 1 9 8

Time: 30 Minutes

Marks: 20

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1.1. Slope of $12x + 35y - 7 = 0$ is ______
(A) $12/35$ (B) $-12/35$ (C) $1/35$ (D) 12

2. Normal form of $x + y = 1$ is ______
(A) $x\cos\frac{\pi}{3} + y\sin\frac{\pi}{3} = \frac{1}{\sqrt{2}}$ (B) $x\cos\frac{\pi}{2} + y\sin\frac{\pi}{2} = 1$
(C) $x\cos\frac{\pi}{4} + y\sin\frac{\pi}{4} = \frac{1}{\sqrt{2}}$ (D) $x + y = 2$

3. If $P(x, y) = 40x + 50y$ then $P(1, -1) =$ ______
(A) 10 (B) 40 (C) 50 (D) -10

4. Centre of $5x2 + 5y2 + 24x + 36y + 10 = 0$ is ______
(A) $(-12, -18)$ (B) $\left(\frac{-12}{5}, \frac{-18}{5}\right)$ (C) $(12, 18)$ (D) $(-12, 18)$

5. Axis of $y2 = -4ax$ is ______
(A) $y = 0$ (B) $y = a$ (C) $x = 0$ (D) $x = a$

6. Vertices of $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is ______
(A) $(\pm b, 0)$ (B) (a, b) (C) $(\pm a, 0)$ (D) $(-a, -b)$

7. Scalar triple product of coplaner vectors is ______
(A) 1 (B) 0 (C) 2 (D) -1

8. $2\underline{i} \times 2\underline{j} \cdot 2\underline{k} =$ ______
(A) 4 (B) 2 (C) 8 (D) 16

9. Which one is even function
(A) $\sin x$ (B) $\cos x$ (C) $\tan x$ (D) x^{101}

10. If $f(x) = \sqrt{x^2 - 9}$; then range of $f(x)$ is ______
(A) $(0, -\infty)$ (B) $(-\infty, \infty)$ (C) $(-5, 5)$ (D) $(0, +\infty)$

11. $\frac{d}{dx} 2^x =$ ______
(A) $2^x \ln 2$ (B) $2^x \ln e$ (C) $2^x \ln 4$ (D) $x\, 2^{x-1}$

12. Leibniz used ______ notation for derivative.
(A) $\dot{f}(x)$ (B) $f'(x)$ (C) $D f(x)$ (D) $\frac{dy}{dx}$

13. $\frac{d}{dx}(\operatorname{cosec} 7x) =$ ______
(A) $\operatorname{cosec} 7x \cot 7x$ (B) $-\operatorname{cosec} x \cot x$ (C) $-7\operatorname{cosec} 7x \cot 7x$ (D) $\operatorname{cosec} 7x \tan 7x$

14. Which one is decreasing function
(A) $2 - 4x$ (B) $4x - 2$ (C) $4x$ (D) $4x + 5$

15. $d(xy) =$ ______
(A) $xdx + ydy$ (B) $(x + y)dx$ (C) $xdy + ydx$ (D) $xdy - ydx$

16. $\int \sec x \, dx =$ ______
(A) $\ln|\sec x - \tan x| + c$ (B) $\ln|\sec x + \cot x| + c$
(C) $\ln|\sec x + \operatorname{cosec} x| + c$ (D) $\ln|\sec x + \tan x| + c$

17. $\int_0^1 |x|\, dx =$ ______
(A) 1 (B) 2 (C) 0 (D) $1/2$

18. Solve $\frac{1}{y}dy = \frac{1}{x}dx$
(A) $y = xc$ (B) $y = -xc$ (C) $y = x^2 + c$ (D) $xy = c$

19. Distance between $A(-1, 2)$ and $C(2, -6)$ is ______
(A) $\sqrt{73}$ (B) $\sqrt{70}$ (C) 7 (D) 8

20. If $m_1 = m_2$ then lines are ______
(A) perpendicular (B) not parallel
(C) parallel (D) neither parallel nor perpendicular

Roll No.________ to be filled in by the Candidate	Inter. (Part-II)-A-2022

MATHEMATICS (Essay Type) (For All Sessions)

Time: 2:30 Hours **SUBJECTIVE** Marks: 80

SECTION - I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Search the domain and range from the real numbers of $g(x) = \sqrt{x^2-4}$

ii- The real valued functions f and g are defined below. Find (a) $f^2(x)$ (b) $g^2(x)$,

$f(x) = \frac{1}{\sqrt{x-1}}; \quad x \neq 1, \quad g(x) = (x^2+1)^2$

iii- Evaluate $\lim_{x \to \infty} \frac{5x^4 - 10x^2 + 1}{-3x^3 + 10x^2 + 50}$

iv- Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$

v- Give any example and sketch graphically discontinuous function.

vi- Differentiate w.r. to 'x'; $\frac{(1+\sqrt{x})(x - x^{3/2})}{\sqrt{x}}$

vii- Find $\frac{dy}{dx}$ if $y = \sqrt{\frac{a^2+x^2}{a^2-x^2}}$

viii- Find the derivative w.r.t. variable involved $\cos\sqrt{x} + \sqrt{\sin x}$

ix- Find $f'(x)$ if $f(x) = \ell n(\sqrt{e^{2x}+e^{-2x}})$

x- Produce y_2 from $y = e^{ax}\sin bx$

xi- Determine the intervals in which f is increasing or decreasing;

$f(x) = \cos x \qquad x \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$

xii- The perimeter of a triangle is 16 centimeters. If one side is of length 6 cm, what are lengths of the other sides for maximum area of the triangle?

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Use differential find $\frac{dy}{dx}$; $x^4 + y^2 = xy^2$

ii- Evaluate $\int \frac{e^{2x} + e^x}{e^x}\, dx$

iii- Evaluate $\int \sec x\, dx$

iv- Evaluate $\int \sin^{-1} x\, dx$

v- Evaluate $\int e^x \left(\frac{1}{x} + \ell n x\right) dx$

vi- Evaluate $\int \frac{5x+8}{(x+3)(2x-1)}\, dx$

vii- Evaluate $\int_1^2 \frac{x}{x^2+2}\, dx$

viii- Find the area between the x-axis and the curve $y = \sin 2x$ from $x = 0$ to $x = \frac{\pi}{3}$

ix- Show that the points A (–1, 2); B(7, 5) and C(2, –6) are vertices of a right triangle.

x- Find an equation of vertical line through (–5, 3)

xi- Convert $15y - 8x + 3 = 0$ in slope-intercept form.

xii- Find the lines represented by ; $x^2 - 2xy\sec\alpha + y^2 = 0$

4. **Write short answers to any NINE questions:** **(2 x 9 = 18)**

i- Indicate the solution set of inequality $3x - 2y \geq 6$

ii- What is objective function?

iii- Write an equation of circle with centre at $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$

iv- Check the position of the point (5, 6) with respect to the circle $x^2 + y^2 = 81$

v- Find an equation of parabola with focus (–3, 1) and directrix $x = 3$

vi- Determine the equation of ellipse having foci $(\pm 3, 0)$ and minor axis of length 10.

vii- Calculate the eccentricity of $\frac{y^2}{16} - \frac{x^2}{49} = 1$

viii- Find an equation of the normal line to $y^2 = 4ax$ at $(at^2, 2at)$

ix- If O is origin and $\overrightarrow{OP} = \overrightarrow{AB}$, find the point P when A and B are (–3, 7) and (1, 0) Respectively

x- Write the direction cosines of $\underline{v} = 2\underline{i} + 3\underline{j} + 4\underline{k}$

xi- Prove that in any triangle ABC, $a^2 = b^2 + c^2 - 2bc \cos A$

xii- If $\underline{a} + \underline{b} + \underline{c} = 0$, then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c} = \underline{c} \times \underline{a}$

xiii- A force $\vec{F} = 3\underline{i} + 2\underline{j} - 4\underline{k}$ is applied at a point (1, –1, 2). Find the moment of $\vec{F}$ about the point (2, –1, 3)

SECTION – II

Note: Attempt any three questions from the following. **10 x 3 = 30**

5- (a) Show that $\lim\limits_{x \to 0} \frac{a^x - 1}{x} = \log_e a$

(b) Show that $y = x^x$ has maximum value at $x = \frac{1}{e}$

6- (a) Integrate $\int \frac{4 + 7x}{(1+x)^2(2+3x)} dx$

(b) Find the point which is equidistant from the point A(5, 3), B(–2, 2) and C(4, 2). What is radius of circumcircle of triangle ABC.

7- (a) Find $\int_{\pi/6}^{\pi/4} \cos^2\theta \cot^2\theta \, d\theta$

(b) Minimize $Z = 2x + y$ subject to constraints $x + y \geq 3$, $7x + 5y \leq 35$, $x \geq 0$, $y \geq 0$

8- (a) Find the area of the triangular region. Whose vertices are A(5, 3), B(–2, 2), C(4, 2)

(b) Find the length of the chord cut off from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$

9- (a) Find equations of the common tangents to the two conics $\frac{x^2}{16} + \frac{y^2}{25} = 1$ and $\frac{x^2}{25} + \frac{y^2}{9} = 1$

(b) Use vectors, prove that the line segment joining the mid-points of two sides of a triangle is parallel to the third side and half as long.