DAE / IA - 2016

MATH - 212 APPLIED MATHEMATICS - II

PART - A (OBJECTIVE)

Time: 30 Minutes   Marks: 20

Q.1: *Encircle the correct answer.*

1. $\lim_{x\to 2}(x-1)=?$
   [a] 1 [b] 2
   [c] 3 [d] 4

2. $\lim_{x\to \frac{\pi}{2}} \frac{1}{\cos\theta}=?$
   [a] 0 [b] ∞
   [c] 1 [d] $\frac{2}{\pi}$

3. $\frac{d}{dx}\left(\frac{1}{x}\right)=$
   [a] $\frac{1}{x^2}$ [b] $-\frac{1}{x^2}$
   [c] $-\frac{1}{x^3}$ [d] $\frac{2}{x}$

4. $\frac{d}{dx}\left(\sqrt{1+x}\right)=$
   [a] $\frac{1}{\sqrt{1+x}}$ [b] $\frac{1}{2\sqrt{1+x}}$
   [c] $(1+x)^{1/3}$ [d] $\frac{-1}{2\sqrt{1+x}}$

5. $\frac{d}{dx}\left(\tan x^2\right)=$
   [a] $2x\sec^2 x^2$ [b] $\sec^2 x^2$
   [c] $\sec x^2$ [d] $\sec^2 x$

6. $\frac{d}{dx}\left(\sec^{-1} 2x\right)=?$
   [a] $\frac{1}{2x\sqrt{4x^2-1}}$ [b] $\frac{1}{x\sqrt{4x^2-1}}$
   [c] $\frac{1}{x\sqrt{x^2-1}}$ [d] $\frac{1}{2x\sqrt{x^2-1}}$

7. $\frac{d}{dx}\left(e^{3x}\right)=$
   [a] e^{3x-1} [b] e^{x-1}
   [c] $3e^{3x}$ [d] $3xe^{3x}$

8. $\frac{d}{dx}\left(\ell n \sin x\right)=?$
   [a] $\cot x$ [b] $\frac{1}{\sin x}\ell n \sin x$
   [c] $\ell n \cos x$ [d] $\tan x$

9. $\int\left(\sqrt{x}\right)dx=$
   [a] $\frac{1}{2}x^{1/2}$ [b] $\frac{2x^{1/2}}{3}$
   [c] $\frac{2}{3}x^{3/2}$ [d] $\frac{1}{2x^{1/2}}$

10. $\int\left(\frac{\cos x}{\sin x}\right)dx=?$
    [a] $\ell n\cos x$ [b] $\ell n\sin x$
    [c] $\ell n\cot x$ [d] $\frac{\cos^2 x}{2}$

11. $\int\left(e^{2x}\right)dx=?$
    [a] $\frac{e^{2x}}{2}$ [b] $\frac{e^{x^2}}{2}$
    [c] $2e^{2x}$ [d] $\frac{e^{2x+1}}{2}$

12. $\int\left(\frac{-1}{\sqrt{1-x^2}}\right)dx=?$
    [a] $\sin^{-1} x$ [b] $\cos^{-1} x$
    [c] $\sec^{-1} x$ [d] $\sqrt{1-x^2}$

13. $\int(\operatorname{cosec} x)\,dx=$
    [a] $\ell n\,(\operatorname{cosec}x-\cot x)$
    [b] $\ell n \sec x$
    [c] $\ell n\,(\operatorname{cosec}x+\cot x)$
    [d] $\cos x$

14. $\int_0^1 (1)\,dx =$

[a] -1 [b] 0
[c] 1 [d] 2

15. The slope of x-axis is:

[a] $0°$ [b] $30°$
[c] $45°$ [d] $60°$

16. When two lines are parallel:

[a] $m_1 = m_2$ [b] $m_1 m_2 = -1$
[c] $m_1 m_2 = 1$ [d] $m_1 = -m_2$

17. Midpoint of $A(2, 5)$ & $B(7, -3)$:

[a] $\left(\frac{9}{2}, 1\right)$ [b] $\left(1, \frac{9}{2}\right)$
[c] $\left(1, \frac{2}{9}\right)$ [d] $\left(\frac{2}{9}, 1\right)$

18. $y - y_1 = m(x - x_1)$ is the:

[a] Slope intercept form
[b] Intercepts form
[c] Point - Slope form
[d] Two - Points form

19. Radius of the circle $x^2 + y^2 = 1$ is:

[a] 1 [b] 0
[c] 2 [d] -1

20. The center of the circle is $(x-h)^2 + (y-k)^2 = r^2$ is;

[a] (h, k) [b] $(-h, k)$
[c] $(h, -k)$ [d] $(-h, -k)$

Answer Key

1	a	2	b	3	b	4	b	5	a
6	a	7	c	8	a	9	c	10	b
11	a	12	b	13	a	14	a	15	a
16	a	17	a	18	b	19	a	20	a

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DAE / IA - 2016

MATH - 212 APPLIED MATHEMATICS - II

PART - B (SUBJECTIVE)

Time: 2:30 Hrs Marks: 60

Section - I

Q.1: Write short answers to any Twenty Five (25) of the follwing questions. **25 × 2 = 50**

1. If $f(x) = 3x^2 - 7x + 4$, then find $f\left(\frac{1}{x}\right)$.

Sol. As, $f(x) = 3x^2 - 7x + 4$

Replace 'x' by '$1/x$', we have:

$$f\left(\frac{1}{x}\right) = 3\left(\frac{1}{x}\right)^2 - 7\left(\frac{1}{x}\right) + 4$$

$$= \frac{3}{x^2} - \frac{7}{x} + 4 = \boxed{\frac{3 - 7x + 4x^2}{x^2}}$$

2. Show that the function $f(x) = x^4 - 7x^2 + 7$ is an even function of 'x'.

Sol. $f(x) = x^4 - 7x^2 + 7$

Replace 'x' by '−x', we have:

$$f(-x) = (-x)^4 - 7(-x)^2 + 7$$

$$f(-x) = x^4 - 7x^2 + 7$$

$$f(-x) = f(x)$$

Hence $f(x)$ is an $\boxed{\text{even}}$ function.

3. Evaluate: $\lim_{x \to 3} \sqrt{25 - x^2}$

Sol. $\lim_{x \to 3} \sqrt{25 - x^2}$

$$= \sqrt{25 - (3)^2} = \sqrt{25 - 9} = \sqrt{16} = \boxed{4}$$

4. ~~Evaluate: $\lim_{x \to 0} \frac{1 - \cos x}{\sin^2 x}$~~

Sol. $\lim_{x \to 0} \frac{1 - \cos x}{\sin^2 x}$ $\left(\frac{0}{0}\right)$ form

$$= \lim_{x\to 0} \frac{1-\cos x}{\sin^2 x} \times \frac{1+\cos x}{1+\cos x}$$

$$= \lim_{x\to 0} \frac{(1)^2 - (\cos x)^2}{\sin^2 x(1+\cos x)}$$

$$= \lim_{x\to 0} \frac{1-\cos^2 x}{\sin^2 x(1+\cos x)}$$

$$= \lim_{x\to 0} \frac{\sin^2 x}{\sin^2 x(1+\cos x)}$$

$$= \lim_{x\to 0} \frac{1}{1+\cos x}$$

$$= \frac{1}{1+\cos 0} = \frac{1}{1+1} = \boxed{\frac{1}{2}}$$

5. **Find $\frac{dy}{dx}$ if $y = x^3 + x^2 + 2x + 3$**

Sol. Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}(y) = \frac{d}{dx}\left(x^3 + x^2 + 2x + 3\right)$$

$$\frac{dy}{dx} = 3x^2 + 2x + 2(1) + 0$$

$$\boxed{\frac{dy}{dx} = 3x^2 + 2x + 2}$$

6. **Differentiate $\frac{1}{\sqrt{a^2 - x^2}}$**

Sol.

$$\frac{d}{dx}\left(\frac{1}{\sqrt{a^2 - x^2}}\right)$$

$$= \frac{d}{dx}\left(\left(a^2 - x^2\right)^{-\frac{1}{2}}\right)$$

$$= -\frac{1}{2}\left(a^2 - x^2\right)^{-\frac{1}{2}-1}\left(\frac{d}{dx}\left(a^2 - x^2\right)\right)$$

$$= -\frac{1}{2}\left(a^2 - x^2\right)^{-\frac{3}{2}}(0 - 2x)$$

$$= \frac{-1(-2x)}{2\left(a^2 - x^2\right)^{\frac{3}{2}}} = \boxed{\frac{x}{\left(a^2 - x^2\right)^{\frac{3}{2}}}}$$

7. **Find $\frac{dy}{dx}$ at the given point, if $y = x^{\frac{2}{3}}$ at $x = 8$.**

Sol.

$$\frac{d}{dx}(y) = \frac{d}{dx}\left(x^{\frac{2}{3}}\right)$$

$$\frac{dy}{dx} = \frac{2}{3}x^{-\frac{1}{3}}$$

$$\frac{dy}{dx} = \frac{2}{3x^{\frac{1}{3}}}$$

At $x = 8$

$$\left.\frac{dy}{dx}\right|_{x=8} = \frac{2}{3(8)^{\frac{1}{3}}} = \frac{2}{3\left(2^3\right)^{\frac{1}{3}}}$$

$$\left.\frac{dy}{dx}\right|_{x=8} = \frac{2}{3(2)} \Rightarrow \boxed{\frac{dy}{dx} = \frac{1}{3}}$$

8. **Find $\frac{dy}{dx}$ if $x^3 + y^3 + 4 = 0$**

Sol. Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}\left(x^3 + y^3 + 4\right) = \frac{d}{dx}(0)$$

$$3x^2 + 3y^2\frac{dy}{dx} + 0 = 0$$

$$3y^2\frac{dy}{dx} = -3x^2$$

$$\frac{dy}{dx} = \frac{-3x^2}{3y^2} \Rightarrow \boxed{\frac{dy}{dx} = -\frac{x^2}{y^2}}$$

9. **Differentiate $x^3 + 8$ w.r.t. $x^2 + 4$**

Sol. Let $y = x^3 + 8$ & $t = x^2 + 4$

Differentiate both sides w.r.t. 'x':

$$\frac{d}{dx}(y) = \frac{d}{dx}\left(x^3 + 8\right) \qquad \frac{d}{dx}(t) = \frac{d}{dx}\left(x^2 + 4\right)$$

$$\frac{dy}{dx} = 3x^2 + 0 \qquad \frac{dt}{dx} = 2x + 0$$

$$\frac{dy}{dx} = 3x^2 \qquad \frac{dx}{dt} = \frac{1}{2x}$$

using chain rule:

$$\frac{dy}{dt} = \frac{dy}{dx} \times \frac{dx}{dt} = 3x^2 \times \frac{1}{2x} = \boxed{\frac{3}{2}x}$$

10. **Find the derivative of $x\cot x$ w.r.t. 'x'.**

Sol. $\frac{d}{dx}(x\cot x)$ {using Product Rule}

$= \left(\frac{d}{dx}(x)\right)\cot x + x\left(\frac{d}{dx}(\cot x)\right)$

$= 1.\cot x + x(-\operatorname{cosec}^2 x)$

$= \boxed{\cot x - x\operatorname{cosec}^2 x}$

11. ~~Find the value of $\frac{d}{dx}(\sin^{-1}x + \cos^{-1}x)$~~

Sol. $\frac{d}{dx}(\sin^{-1}x + \cos^{-1}x)$

$= \frac{1}{\sqrt{1-x^2}} - \frac{1}{\sqrt{1-x^2}} = \boxed{0}$

12. ~~Find $\frac{d}{dx}\left(a^{x^2}\right)$~~

Sol. $\frac{d}{dx}\left(a^{x^2}\right)$

$= a^{x^2}(\ell n\, a)\left(\frac{d}{dx}(x^2)\right)$

$= a^{x^2}(\ell n\, a)(2x) = \boxed{2x(\ell n\, a)a^{x^2}}$

13. **Find the derivative of $\log(\cos^2 x)$**

Sol. $\frac{d}{dx}(\log(\cos^2 x))$

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

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

$= \frac{2}{\cos x}(-\sin x)$

$= -\frac{2\sin x}{\cos x} = \boxed{-2\tan x}$

14. **Find $\frac{dy}{dx}$ when**

$x = a\sin t, \quad y = \cos at$

Sol. $x = a\sin t, \quad y = \cos at$

Differentiate both equations both sides w.r.t. 't':

$\frac{d}{dt}(x) = \frac{d}{dt}(a\sin t)$ | $\frac{d}{dt}(y) = \frac{d}{dt}(\cos at)$

$\frac{dx}{dt} = a\cos t$

$\frac{dt}{dx} = \frac{1}{a\cos t}$

$\frac{dy}{dt} = -\sin at\left(\frac{d}{dt}(at)\right)$

$\frac{dy}{dt} = -\sin at(a)$

$\frac{dy}{dt} = -a\sin at$

By using Chain's Rule: $\frac{dy}{dx} = \frac{dy}{dt}.\frac{dt}{dx}$

$\frac{dy}{dx} = (-a\sin at)\left(\frac{1}{a\cos t}\right)$

$\boxed{\frac{dy}{dx} = -\frac{\sin at}{\cos t}}$

15. **If $y = \ell n x$, find y_2**

Sol. $y = \ell n x$

Differentiate both sides w.r.t. 'x':

$\frac{d}{dx}(y) = \frac{d}{dx}(\ell n x)$

$y_1 = \frac{1}{x}$

Differentiate both sides w.r.t. 'x':

$\frac{d}{dx}(y_1) = \frac{d}{dx}\left(\frac{1}{x}\right)$

$y_2 = \frac{d}{dx}(x^{-1}) = -1(x)^{-2} = \boxed{\frac{-1}{x^2}}$

16. **Find the turning point of the curve $y = x^2 - 3x + 3$.**

Sol. $y = x^2 - 3x + 3.$

Differentiate both sides w.r.t. 'x':

$\frac{d}{dx}(y) = \frac{d}{dx}(x^2 - 3x + 3)$

$\frac{dy}{dx} = 2x - 3$

For turning point Put $\frac{dy}{dx} = 0$

$$2x - 3 = 0$$

$$2x = 3 \quad \Rightarrow \quad \boxed{x = 3/2}$$

17. Find $\int \left(x + \frac{1}{x}\right)^2 dx$

Sol. $\int \left(x + \frac{1}{x}\right)^2 dx$

$$= \int \left(x^2 + \frac{1}{x^2} + 2\right) dx$$

$$= \int \left(x^2 + x^{-2} + 2\right) dx$$

$$= \frac{x^3}{3} + \frac{x^{-1}}{-1} + 2x + c$$

$$= \boxed{\frac{x^3}{3} - \frac{1}{x} + 2x + c}$$

18. Find $\int \left(e^{3x} + e^{5x}\right) dx$

Sol. $\int \left(e^{3x} + e^{5x}\right) dx$

$$= \boxed{\frac{e^{3x}}{3} + \frac{e^{5x}}{5} + c} \quad \left\{\begin{array}{l}\text{Using formula # 05} \\ \text{from page # 282}\end{array}\right\}$$

19. Evaluate $\int \left(\frac{\sin 2x}{\sin x}\right) dx$

Sol. $\int \left(\frac{\sin 2x}{\sin x}\right) dx$

$$= \int \left(\frac{2 \sin x \cos x}{\sin x}\right) dx \quad \because \left\{\begin{array}{l}\sin 2x \\ = 2 \sin x \cos x\end{array}\right\}$$

$$= 2\int (\cos x) dx = \boxed{2 \sin x + c}$$

20. Find $\int \left(\frac{-2x}{\sqrt{4 - x^2}}\right) dx$

Sol. $\int \left(\frac{-2x}{\sqrt{4 - x^2}}\right) dx$

$$= \int \left(4 - x^2\right)^{-1/2} (-2x)\, dx$$

$$= \frac{\left(4 - x^2\right)^{1/2}}{1/2} + c \left\{\begin{array}{l}\text{using} \\ \text{Rule-I}\end{array}\right\} \quad \boxed{\begin{array}{l}\frac{d}{dx}\left(4 - x^2\right) \\ = 0 - 2x \\ = -2x\end{array}}$$

$$= \boxed{2\sqrt{4 - x^2} + c}$$

21. Find $\int \left(\frac{1}{x(\ell n x)}\right) dx$

Sol. $\int \left(\frac{1}{x(\ell n x)}\right) dx$

$$= \int \frac{1}{t}\, dt \quad \boxed{\begin{array}{l}\text{Put } \ell n x = t \\ \frac{1}{x} dx = dt\end{array}}$$

$$= \ell n\,|t| + c$$

$$= \boxed{\ell n\,|\ell n x| + c}$$

22. Integrate $\int \sin^2 x dx$

Sol. $\int \sin^2 x dx$

$$= \int \left(\frac{1 - \cos 2x}{2}\right) dx \quad \because \left\{\begin{array}{l}\sin^2 x \\ \frac{1 - \cos 2x}{2}\end{array}\right\}$$

$$= \frac{1}{2}\left[\int (1) dx - \int (\cos 2x) dx\right]$$

$$= \boxed{\frac{1}{2}\left[x - \frac{\sin 2x}{2}\right] + c}$$

23. ~~**Evaluate** $\int \frac{1}{a^2 + 9x^2} dx$~~

Sol. $\int \frac{1}{a^2 + 9x^2} dx$

$$= \int \frac{1}{9\left(\frac{a^2}{9} + x^2\right)} dx = \frac{1}{9} \int \frac{1}{\left(\frac{a}{3}\right)^2 + (x)^2} dx$$

$$= \frac{1}{9} \cdot \frac{1}{\left(\frac{a}{3}\right)} \tan^{-1}\left(\frac{x}{a/3}\right) + c$$

$$= \boxed{\frac{1}{3a} \tan^{-1}\left(\frac{3x}{a}\right) + c}$$

24. **Evaluate** $\int \left(x e^{x}\right) dx$

Sol. $\int \left(x\, e^{x}\right) dx$

Integrating by parts:

taking $u = x$ & $v = e^{x}$

$= x\int e^{x}dx - \int\left(\frac{d}{dx}(x)\int e^{x}dx\right)dx$

$= x\ e^{x} - \int 1.e^{x}\, dx$

$= x\, e^{x} - \int e^{x}\, dx$

$= x\ e^{x} - e^{x} + c = \boxed{e^{x}(x-1)+c}$

25. **Evaluate** $\int_1^3 \frac{1}{x+1}dx$

Sol. $\int_1^3 \frac{1}{x+1}dx$

$= \left[\ell n(x+1)\right]_1^3$ {using Rule-II}

$= \ell n(3+1) - \ell n(1+1)$

$= \ell n(4) - \ell n(2)$

$= \ell n\left(\frac{4}{2}\right) = \boxed{\ell n 2}$

26. **Evaluate** $\int_0^1 \frac{1}{\sqrt{1-x^2}}dx$

Sol. $\int_0^1 \frac{1}{\sqrt{1-x^2}}dx$

$= \left[\sin^{-1}x\right]_0^1$

$= \sin^{-1}(1) - \sin^{-1}(0)$

$= 90° - 0° = \frac{\pi}{2} - 0 = \boxed{\frac{\pi}{2}}$

27. **Evaluate** $\int_0^{\pi/4} \frac{dx}{\cos^2 x}$

Sol. $\int_0^{\pi/4} \frac{dx}{\cos^2 x} = \int_0^{\pi/4}\left(\sec^2 x\right)dx$

$= \left[\tan x\right]_0^{\pi/4}$ {Using formula # 13 from page # 282}

$= \tan\left(\frac{\pi}{4}\right) - \tan(0)$

$= \tan(45°) - \tan(0°)$ $\left\{\frac{\pi}{4}\times\frac{180}{\pi} = 45°,\ 0\times\frac{180}{\pi} = 0°\right\}$

$= 1 - 0 = \boxed{1}$ {using calculator $\tan(45°)=1$ & $\tan(0°)=0$}

28. **Write distance formula between two points and give one example.**

Sol. Let $A(x_1, y_1)$ & $B(x_2, y_2)$ be two different points, then,

Distance $= |AB| = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$

Example: Let A(0, 0), B(1, 1) be two points, then

$|\overline{AB}| = \sqrt{(0-1)^2 + (0-1)^2}$

$|\overline{AB}| = \sqrt{1+1} = \sqrt{2}$

19. **Find the coordinates of the mid-point of the segment $P_1(3, 7)$ and $P_2(-2, 3)$.**

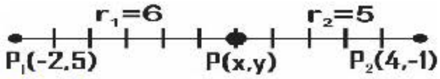
Sol. $\text{Mid-point} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

$= \left(\frac{3+(-2)}{2}, \frac{7+3}{2}\right)$

$= \left(\frac{3-2}{2}, \frac{10}{2}\right) = \boxed{\left(\frac{1}{2}, 5\right)}$

30. ~~**Find the coordinates of the point $P(x, y)$ which divide internally the segment through $P_1(-2, 5)$ and $P_2(4, -1)$ of the ratio of $\frac{r_1}{r_2} = \frac{6}{5}$.**~~

Sol. Here: $r_1 = 6,\ r_2 = 5,\ (x_1, y_1) = (-2, 5)$ & $(x_2, y_2) = (4, -1)$



$$P(x\,,\,y)=\left(\frac{r_1x_2+r_2x_1}{r_1+r_2},\frac{r_1y_2+r_2y_1}{r_1+r_2}\right)$$

$$=\left(\frac{6(4)+5(-2)}{6+5},\frac{6(-1)+5(5)}{6+5}\right)$$

$$=\left(\frac{24-10}{11},\frac{-6+25}{11}\right)=\boxed{\left(\frac{14}{11},\frac{19}{11}\right)}$$

31. **Reduce the equation $3x+4y-2=0$ into intercept form.**

Sol. $3x+4y-2=0$

$3x+4y=2$

Dividing both sides by 2, we have:

$$\frac{3x}{2}+\frac{4y}{2}=\frac{2}{2}$$

$$\frac{x}{2/3}+\frac{y}{2/4}=1 \Rightarrow \boxed{\frac{x}{2/3}+\frac{y}{1/2}=1}$$

32. ~~**Find the distance from the point $(-2,1)$ to the line $3x+4y-12=0$**~~

Sol.

Distance between point & line

$$D=\frac{|ax_1+by_1+c|}{\sqrt{a^2+b^2}}$$

$$D=\frac{|3(-2)+4(1)-12|}{\sqrt{(3)^2+(4)^2}}$$

$$D=\frac{|-6+4-12|}{\sqrt{9+16}}=\frac{|-14|}{\sqrt{25}}=\boxed{\frac{14}{5}}$$

33. ~~**Find the equation of the line passing through the point $(2,-3)$ and having slope $-\frac{1}{2}$.**~~

Sol. Equation of line in point-slope form:

$$y-y_1=m(x-x_1)$$

$$y-3=-\frac{1}{2}(x-(-2))$$

$$2(y-3)=-1(x+2)$$

$$2y-6=-x-2$$

$$2y-6+x+2=0$$

$$\boxed{x+2y-4=0}$$

34. ~~**Find the equation of a line through the points $(-1,2)$ and $(3,4)$.**~~

Sol. Slope $=\frac{y_2-y_1}{x_2-x_1}=\frac{4-2}{3-(-1)}=\frac{2}{4}=\frac{1}{2}$

Equation of line in point-slope form:

$$y-y_1=m(x-x_1)$$

$$y-2=\frac{1}{2}(x-(-1))$$

$$2(y-2)=1(x+1)$$

$$2y-4=x+1$$

$$2y-4-x-1=0$$

$$-x+2y-5=0$$

$$\boxed{x-2y+5=0}$$

35. **Define point circle.**

Sol. A circle is called point circle if $r=0$

36. **Write the equation of circle with, center at $(h\,,\,k)$ and radius 'r'.**

Sol. $\boxed{(x-h)^2+(y-k)^2=r^2}$

37. **Find center and radius of the circle $x^2+y^2-4x+y-1=0$**

Sol. $x^2+y^2-4x+y-1=0$

Comparing with General form of equation of circle:

$$x^2+y^2+2gx+2fy+c=0$$

$2g = -4$, $g = -\frac{4}{2}$, $g = 2$ | $2f = 1$, $f = \frac{1}{2}$ | $c = -1$

$\text{Center} = (-g, -f)$

$= \left(-(-2), -\frac{1}{2}\right) = \boxed{\left(2, -\frac{1}{2}\right)}$

$\text{Radius} = r = \sqrt{g^2 + f^2 - c}$

$r = \sqrt{(-2)^2 + \left(\frac{1}{2}\right)^2 - (-1)}$

$r = \sqrt{4 + \frac{1}{4} + 1}$

$r = \sqrt{\frac{16 + 1 + 4}{4}}$

$r = \sqrt{\frac{21}{4}}$

$r = \boxed{\frac{\sqrt{21}}{2}}$

Section - II

Note: Attemp any three (3) questions $\boxed{3 \times 10 = 30}$

Q.2.[a] Show that $\frac{e^x + 1}{e^x - 1}$ is an odd function of $'x'$.

Sol. See Q.12(i) of Ex # 1.1 (Page # 10)

[b] Find the derivative $\sqrt{\frac{1+x}{1-x}}$ w.r.t. $'x'$.

Sol. See Q.4(iv) of Ex # 2.2 (Page # 55)

Q.3.[a] Find the derivative of $\sin^2 x \cos^3 x$ w.r.t. $'x'$.

Sol. See Q.3(iv) of Ex # 3.1 (Page # 113)

[b] Find the maximum and minimum values of the function $x^2 - 4x - 6$.

Sol. See Q.2(i) of Ex # 4.2 (Page # 183)

Q.4.[a] Integrate $\int \left(\frac{1}{\sqrt{1+x} - \sqrt{x}}\right) dx$

Sol. See Q.16 of Ex # 5.1 (Page # 232)

[b] Find $\int (\cos^3 x) dx$

Sol. See example # 5 of Chapter 06.

Q.5.[a] Evaluate $\int (x^2 e^x) dx$

Sol. See example # 16 of Chapter 06.

[b] Find the point which is $\frac{7}{10}$ of the way from the point (4, 5) to the point (-6, 10).

Sol. See Q.5 of Ex # 8.2 (Page # 366)

Q.6.[a] ~~A line is parallel to the line 2x + 3y = 5 and pass through (-1, 3). Find an equation for the line.~~

Sol. See Q.8 of Ex # 8.4 (Page # 387)

[b] Find which of the two circles $x^2 + y^2 - 3x + 4y = 0$ and $x^2 + y^2 - 6x - 8y = 0$ is greater.

Sol. See Q.7 of Ex # 9 (Page # 446)

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