HEBRON MATRIC HR SEC. SCHOOL MANJAMPOONDI

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STD: XI SUB:- MATHS

HALF YEARLY KEY ANSWER.

I. CHOOSE:-

1. (c) 1
2. (c) n
3. (c) $[0, 1)$
4. (c) $(-8, 8)$
5. (c) 3
6. (a) 0
7. (a) $b \le \sqrt{2}$ then $b^2 - 1$
8. (d) $4/15$
9. (c) $12/5$
10. (c) $9/16$
11. (d) $A - A^T$
12. (b) $15/4$
13. (d) one Coplanar
14. (c) $\sqrt{2}$
15. (a) $1/2$
16. (c) $\log 3 (3^x + 3x^2)$
17. (b) 2
18. (d) There is no derivative
19. (b) $\frac{1}{2} + \frac{\pi}{4}$
20. (a) 2

II Two Marks

(21) $f(x) = 2x^3$ is $f : [-2, 2] \to B$

$f(-2) = -16 \quad f(2) = 16$

$\therefore B \Rightarrow [-16, 16]$

(22) $f(-3) = 1$

$f(0) = -3$

(23) $\dfrac{1}{(2+x)^4} = \cancel{2x} \, (2+x)^{-4}$

$\Rightarrow 2^{-4}\left(1 + x/2\right)^{-4}$

$= \dfrac{1}{2^4}\left(1 + x/2\right)^{-4}$

$= \dfrac{1}{16}\Big[1 - 4(x/2) + 4(5)(x/2)^2$

$- 4(5)6(\frac{x}{2})^3 \ldots\Big]$

(24) $(x-2y)(2x+y) = 0$

$m_1 m_2 = -1$

(25) $|B| = 0 \qquad b = 49/8$

(26) $A - B + C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = I$

(27) $\sin^{-1}(3x - 4x^3)$

Let $x = \sin\theta \qquad \theta = \sin^{-1} x$

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$y = \sin^{-1}(3\sin\theta - 4\sin^3\theta)$

$= \sin^{-1}\sin 3\theta = 3\theta$

$\therefore y = 3\sin^{-1}x$

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

(28) $\lim_{x\to\infty}\left(\frac{x+2}{x-2}\right)^x = e^4$

Solve

$\lim_{x\to\infty}\left(1+\frac{4}{x-2}\right)^{x-2+2}$

$\lim_{x-2\to\infty}\left(1+\frac{4}{x-2}\right)^{x-2}\left(1+\frac{4}{x-2}\right)^2$

$= e^4(1)$

$= e^4.$

(29) $f(x) = \sqrt{1-x^2}$ is $[-1,1]$

$\lim_{x\to -1^+} f(x) = 0 = f(-1)$

$\lim_{x\to -1^-} f(x) = 0 = f(-1)$

$\therefore$ It is continuous.

(30) $f(x) = |x-3|$

$|x-3| = \begin{cases} -(x-3) & x < 3 \\ (x-3) & x \geq 3 \end{cases}$

$$f(x) = \begin{cases} -1 & x < 3 \\ 1 & x \geq 3 \end{cases}$$

$f'(2) = -1 \qquad f'(4) = 1$

III. THREE MARKS

(31) Sol: $f(x) = 2x^2 - 1$

$2x^2 - 1 = 17 \Rightarrow x = 3, -3$

$2x^2 - 1 = 4 \Rightarrow x = \pm\sqrt{5/2}$

$2x^2 - 1 = -2 \quad = x^2 = -1/2$

(32) $\dfrac{1}{1 - 2\sin x}$

$-1 \leq \sin x \leq 1$

$-1 \geq \dfrac{1}{1 - 2\sin x} \geq 1/3$

$x \in (-\infty, -1] \cup [1/3, \infty)$

(33) ${}^nP_r = 720 \qquad {}^nC_r = 120$

$\dfrac{{}^nP_r}{{}^nC_r} = \dfrac{720}{120}$

$r = 3 \quad n = 10$

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(34) $a_k = a + (k-1)d$

$a_{k-1} = a + (k-2)d$

$a_{k+1} = a + (k)d$.

$\frac{a_{k-1} + a_{k+1}}{2} = a + (k-1)d$

$= a_k$

(35) Given $p = 12$ $\alpha = 150°$

$x\cos\alpha + y\sin\alpha = p$

solve $\sqrt{3}x - y + 24 = 0$

(36) $\vec{a} = \vec{i} + 2\vec{j} + \vec{k}$

$\vec{b} = \vec{i} + 3\vec{j} + 4\vec{k}$

$\vec{a} \times \vec{b} = 5\vec{i} - 3\vec{j} + \vec{k}$

$|\vec{a} \times \vec{b}| = \sqrt{35}$

$= \pm 10\sqrt{3} \left(\frac{5\vec{i} - 3\vec{j} + \vec{k}}{\sqrt{35}} \right)$

(37) Sol: Given $\frac{\sin|x|}{x}$

$$f(x) = \begin{cases} \frac{\sin(-x)}{x} & -1 < x < 0 \\ \frac{\sin x}{x} & 0 < x < 1 \end{cases}$$

Right hand limit -1

Left hand limit 1

(38) $y = \sin^4 x + \cos^4 x$

$\frac{dy}{dx} = 4\sin^3 x \cos x - 4\cos^3 x \sin$

(39) (ii) symmetric
(iii) Transitive
(i) Reflexive
} → solve.

(40) $\sqrt{3}\sin x + \cos x = 2$

$\div 2$

$\frac{\sqrt{3}}{2}\sin x + \frac{1}{2}\cos x = 1$

$\sin x \cos \pi/6 + \cos x \sin \pi/6 = \sin$

$\sin(x + \pi/6) = \sin \pi/2$

$x + \pi/6 = 1$

$\boxed{x = -\pi/6}$

FIVE MARKS:

(41) $f(x) = \begin{cases} 3x & x \le 0 \\ x & x > 0 \end{cases}$

$f(x) = \begin{cases} x & x \le 0 \\ 3x & x > 0 \end{cases}$

$x \le 0$ $f \circ g(x) = 3x$

$x > 0$ $f \circ g(x) = 3x$

(b) Solve $\dfrac{x^2-4}{x^2-2x-15} \le 0$

$x^2-4=0$ | $x^2-2x-15=0$

$x^2=4$ | $(x-5)(x+3)=0$

$\boxed{x=\pm 2}$ | $x \neq 5$ $x \neq -3$

$\therefore$ Solution set is

$(-3,-2] \cup [2,5)$

(Q2)
(b) $a = 2R\sin A$

$b = 2R\sin B$

$c = 2R\sin C$

RHS

$$= \frac{2R\sin B - 2R\sin C}{2R\sin A} \cos\frac{A}{2}.$$

$$= \frac{\sin\frac{B-C}{2}\cos(90-A/2)}{\sin A/2}$$

$$= \sin\left(\frac{B-C}{2}\right)$$

(Q2) (a)

LHS

$2\sin(A+B)\cos(A-B) + 2\sin C\cos C$

$= 2\sin(\pi/2 - C)\cos(A-B) + 2\sin C\cos C$

$= 2\cos C\,(\cos(A-B) + \sin C]$

$= 2\cos C\,(\cos(A-B) + \sin C]$

$= 2\cos C\,[\cos(A-B) + \cos(A+B)]$

$= 4\cos A\cos B\cos C$

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(45) (a) $\lim_{x \to 1^-} f(x) = \lim_{x \to 1^+} f(x) = 3$

$f(1) = 3$

$\therefore x = 1$ is continuous

$\therefore (-\infty, \infty)$ is also contn.

(b) $y = e^{\tan^{-1} x}$

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

$y'(1+x^2) = y$

$(1+x^2)y'' (2x-1)y' = 0$

(46) (a) $x\left(1+\frac{25}{x^2}\right)^{1/2} - x\left(1+9/x^2\right)^{1/2}$

$x\left(1+25/x^2 - 1 - 9/2x^2\right)$

$= 8/x$

(b). $\lim_{x \to 0} \frac{\sqrt{1+x^2} - x}{x} = \frac{\sqrt{1} - 0}{0}$

$= \infty$

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47 (a) $|\vec{a}| = \sqrt{14}$

$|\vec{b}| = \sqrt{24}$

$\vec{a}\cdot\vec{b} = 8-2+6 = 12$ ---(1)

$$\vec{a}\times\vec{b} = \begin{vmatrix} \hat{i} & \hat{j} & k \\ 2 & 1 & 3 \\ 4 & -2 & 2 \end{vmatrix}$$

$|\vec{a}\times\vec{b}| = 8\sqrt{3}$ ---(2)

$$\sin\theta = \frac{|\vec{a}\times\vec{b}|}{|\vec{a}||\vec{b}|} = \frac{8\sqrt{3}}{\sqrt{24}\sqrt{14}}$$

$$= \frac{2}{\sqrt{7}}$$

$$\cos\theta = \frac{\vec{a}\cdot\vec{b}}{\sqrt{14}\sqrt{24}} = \frac{12}{\sqrt{14}\sqrt{24}}$$

$$= \sqrt{3/7}$$

(b) $u = \sin(ax^2+bx+c)$ $\frac{du}{dx}$

$$\frac{du}{dx} = \cos(ax^2+bx+c)\,(2ax+b)$$

$$v = \cos(lx^2+mx+n)$$

$$\frac{dv}{dx} = -\sin(lx^2+mx+n)\,(2lx+m)$$

$$\therefore \frac{du}{dv} = \frac{\cos(ax^2+bx+c)\cdot(2ax+b)}{-\sin(lx^2+mx+n)\,(2lx+m)}$$