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Calculas AND Analytical Geometry

Assignment: 01

Name: Malik Zaryab Awan
Section: BSE-1A
Roll No: 24K-3055

1) $\lim_{x \to 0} \left(\frac{\sin 5x}{\cos 4x} \right)$

applying limit

$$\frac{\sin 5(0)}{\cos 4(0)} \Rightarrow \frac{\sin(0)}{\cos 0} \Rightarrow \frac{0}{1}$$

0 ANS

2) $\lim_{x \to 0} \left(\frac{\sin^2 3x}{x^2 \cos x} \right) ; \frac{0}{0}$

applying L-hopital Rule

$$\lim_{x \to 0} \frac{2 \sin(3x)(3)}{x^2(-\sin x) + \cos x(2x)}$$

$$\lim_{x \to 0} \frac{6 \sin 3x}{-x^2 \sin x + \cos x \, 2x} ; \frac{0}{0}$$

Again

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2) $\lim_{x\to 0} \left(\dfrac{\sin^2 3x}{x^2 \cdot \cos x}\right)$

$\lim_{x\to 0} \left(\dfrac{\sin^2 3x}{x^2} \cdot \dfrac{1}{\cos x}\right)$

$\lim_{x\to 0} \dfrac{\sin^2 3x}{x^2} \cdot \lim_{x\to 0} \dfrac{1}{\cos x}$

$\lim_{x\to 0} \left(\dfrac{\sin 3x}{x}\right)^2 \cdot \lim_{x\to 0} \dfrac{1}{\cos x}$

$\lim_{x\to 0} \left(\dfrac{\sin 3x \cdot 3}{3x}\right)^2 \cdot \lim_{x\to 0} \cdot \dfrac{1}{\cos x}$

$9 \lim_{x\to 0} \left(\dfrac{\sin 3x}{3x}\right)^2 \cdot \lim_{x\to 0} \dfrac{1}{\cos x}$

applying limit $\quad \because \lim_{x\to 0} \dfrac{\sin x}{x} = 1$

$9 \; (1)^2 \cdot \dfrac{1}{\cos 0} \quad \because \cos 0 = 1$

9 ANS

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3) $\lim_{x \to 0} \left[\frac{\sin 5x}{\sin \frac{1}{3}x} \right]$

~~$\lim_{x\to 0} \sin 5x \div \lim_{x \to 0} \sin \frac{1}{3}x$~~

$\lim_{x \to 0} \left(\frac{\sin 5x}{\sin(\frac{1}{3}x)} \right) ; \frac{0}{0}$

Applying L-Hopital Rule

$\lim_{x \to 0} \frac{\cos 5x \, (5)}{\cos(\frac{1}{3}x) \cdot \frac{1}{3}}$

$15 \lim_{x \to 0} \frac{\cos 5x}{\cos(1/3 x)}$

applying limit

$15 \frac{\cos(0)}{\cos 0}$

15 ANS

4) $\lim_{x \to 0} \left(\frac{x}{\tan x} \right) ; \frac{0}{0}$

Applying L-Hopital Rule

$\lim_{x \to 0} \left(\frac{1}{\sec^2 x} \right)$ $\because \cos x = \frac{1}{\sec x}$

$\lim_{x \to 0} \left(\cos^2 x \right)$

Applying limit

$\cos(0)$

1 ANS

5) $\lim_{x \to \pi/2} \frac{1 + \sin x}{1 - \cos x}$

$\lim_{x \to \pi/2} \frac{1 + \sin x}{1 - \cos x}$

applying limit

$\frac{1 + \sin(\pi/2)}{1 - \cos \pi/2}$ $\because \sin 90 = 1$, $\cos 90 = 0$

$\frac{1+1}{1-0}$

2 ANS

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6) $\lim_{x \to \infty} \frac{\cos 2x}{x^2}$

$\lim_{x \to \infty} \cos 2x \div \lim_{x \to \infty} x^2$

$\lim_{x \to \infty} \cos 2x \times \lim_{x \to \infty} \frac{1}{x^2}$

Applying limit

$\cos \infty \times \frac{1}{\infty}$

$\cos \infty \times 0$

0

ANS

) $\lim_{x \to \infty} \frac{6x^3 - 5x}{x^2 + 4x^3}$

$\lim_{x \to \infty} \frac{\cancel{x^3}(6 - 5/x^2)}{\cancel{x^3}(\frac{1}{x} + 4)}$

Applying limit

$\frac{6 - \frac{5}{\infty}}{\frac{1}{\infty} + 4}$ $\because \frac{1}{\infty} = 0$

$\frac{6 - 5(0)}{0 + 4}$

$\frac{\cancel{6}\,3}{\cancel{4}\,2}$

$\frac{3}{2}$ ANS

8) $\lim_{x \to b} \frac{4a^2 - x^2}{2a + x}$

applying limit

$\frac{4a^2 - b^2}{2a + b}$

$\frac{(2a)^2 - (b)^2}{2a + b}$

$\frac{\cancel{(2a+b)}(2a-b)}{\cancel{(2a+b)}}$

$2a - b$ ANS

9) $\lim_{x \to \infty} \frac{8x^3 - 5x}{x^2 - 3x}$

$\lim_{x \to \infty} \frac{\cancel{x^2}(8x - 5/x)}{\cancel{x^2}(1 - 3/x)}$

applying limit

$\frac{\infty - 5/\infty}{1 - 3/\infty}$

$\frac{\infty - 0}{1 - 0}$

∞ ANS

10) $\lim_{x\to\infty} \frac{x^2+x^4}{x^2+x^6}$

$\lim_{x\to\infty} \frac{\cancel{x^4}(1/x^2+1)}{x^{\cancel{6}2}(1/x^4+1)}$

$\lim_{x\to\infty} \frac{(1/x^2+1)}{1/x^2+x^2}$

Applying limit

$\frac{0+1}{0+\infty}$

$\frac{1}{\infty}$

0 ANS

11) $\lim_{x\to 2} \frac{4x^3-32}{5x^2-20}$

$\lim_{x\to 2} \frac{x^{\cancel{3}}(4-32/x^3)}{\cancel{x^2}(5-20/x^2)}$

$\lim_{x\to 2} \frac{x(4-32/x^3)}{5-20/x^2}$

~~Applying limit~~

$\cancel{\frac{2(4-32/8)}{5-20/4}}$

$\lim_{x\to 2} \frac{4x-32/x^2}{5-20/x^2}$

11) $\lim_{x\to 2} \frac{4x^3-32}{5x^2-20}$; $\frac{0}{0}$

applying L-hopital Rule

$\lim_{x\to 2} \frac{4(3x^2)-0}{5(2x)-0}$

$\lim_{x\to 2} \frac{\cancel{12}^{6}\cancel{x^2}}{\cancel{10}_{5}\,x}$

$\lim_{x\to 2} \frac{6x}{5}$

applying limit

$\frac{12}{5}$ ANS

12) $\lim_{x\to 4^-} \frac{5}{x-4}$

applying limit

$\frac{5}{4-4}$

$\frac{5}{0}$

∞

$-\infty$

ANS

13) $\lim_{x \to 0} \frac{4}{x} \sin(x/5)$

$4 \lim_{x \to 0} \frac{\sin(\frac{x}{5})}{x}$

$4 \lim_{x \to 0} \frac{\sin(\frac{x}{5})}{\left(\frac{x}{5}\right)5}$

$\frac{4}{5} \lim_{x \to 0} \frac{\sin x/5}{x/5}$

$\because \lim_{x \to 0} \frac{\sin x}{x} = 1$

$\frac{4}{5}$ ANS

14) $f(x) = \sqrt{x^2 - 9} + 1$

$y = \sqrt{x^2 - 9} + 1$

DOMAIN $\Rightarrow$

$x^2 - 9 \geq 0$

$x^2 \geq 9$

$x \geq \pm 3$

+ve	-ve	+ve

$\infty \quad -3 \quad 3 \quad +\infty$

$D, \Rightarrow (-\infty, -3) \cup (3, +\infty)$

RANGE:-

Inverse function

$\Rightarrow x = \sqrt{y^2 - 9} + 1$

$x - 1 = \sqrt{y^2 - 9}$

$(x-1)^2 = y^2 - 9$

$y^2 = (x-1)^2 + 9$

$y = \sqrt{(x-1)^2 + 9}$

Domain of inverse func

$\Rightarrow D, (-\infty, +\infty)$

Since domain of inverse func = Range of orignal function.

Range of orignal function $= (-\infty, +\infty)$

But, since the orignal function is square root

$R \Rightarrow (0, +\infty)$

Since +1 is outside root

Range $\Rightarrow (1, +\infty)$

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15) $\lim_{x \to 1} \frac{4x^3 - 5}{5x^2 - 6}$

applying limit

$\frac{4(1)^3 - 5}{5(1)^2 - 6}$

$\frac{4-5}{5-6}$

$\frac{-1}{-1}$

1 ANS

16) $f(x) = 3x^3 - 5x$

replace x with $-x$

$f(-x) = 3(-x)^3 - 5(-x)$
$= -3x^3 + 5x$
$f(-x) = -(3x^3 - 5x)$
$\because f(-x) = -f(x)$

It's Odd function

17) $\lim_{x \to 2^+} \frac{2x - 2}{x - 4}$

applying limit

$\frac{2(2) - 2}{2 - 4} \Rightarrow \frac{4-2}{-2}$

$\frac{2}{-2}$

-1 ANS

18) $3x - 4y = 12$ $(-3, 1)$

$3x - 4y - 12 = 0$

slope $= -\frac{\text{coefficient of } x}{\text{coefficient of } y}$

slope $= m_1 = \frac{-3}{-4}$

$\boxed{m_1 = \frac{3}{4}}$

$\because m_1 \times m_2 = -1$

$m_2 = \frac{-1}{m_1}$

$m_2 = \frac{-1}{3/4}$

$m_2 = -\frac{4}{3}$

By using slope point form, i.e $m = \frac{y - y_1}{x - x_1}$

$m_2 = \frac{y - y_1}{x - x_1}$

$\because$ passing through point $(-3, 1)$ $\frac{-4}{3} = \frac{y - 1}{x + 3}$

$-4x - 12 = 3y - 3$

$4x + 3y - 3 + 12 = 0$

$\boxed{4x + 3y + 9 = 0}$

This is the eq of line perpendicular to $3x - 4y = 12$

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19) $\lim\limits_{x\to\infty} \dfrac{8x^2 - 2x^3}{2x^2 + 4x}$

$\lim\limits_{x\to\infty} \dfrac{\cancel{x^2}(8-2x)}{\cancel{x^2}(2+4/x)}$

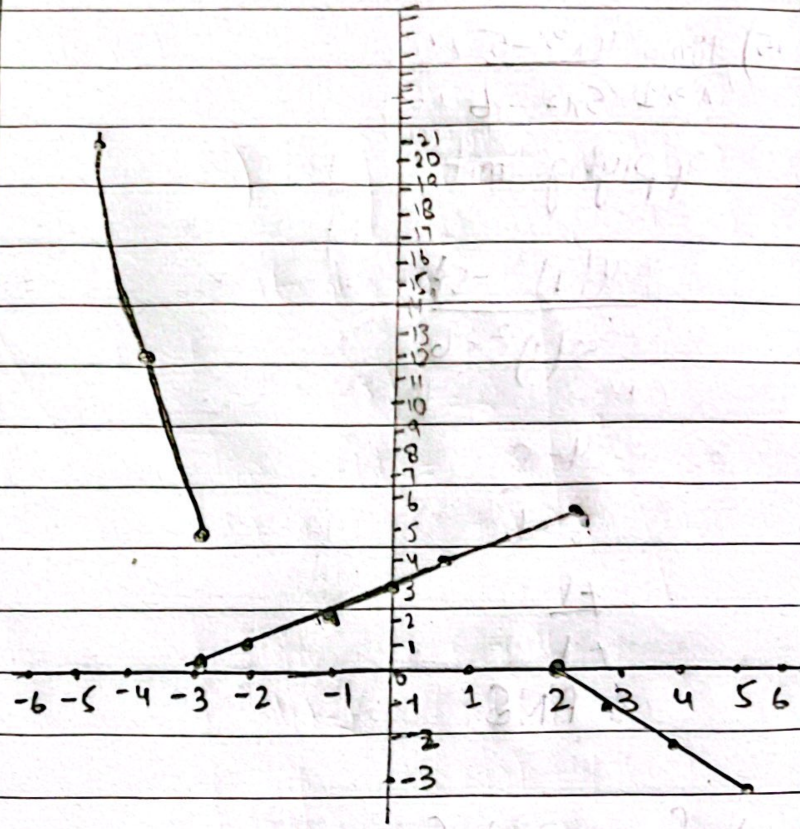
$\lim\limits_{x\to\infty} \dfrac{x(8/x-2)}{2+4/x}$

applying limit

$\dfrac{\infty(0-2)}{2+\frac{4}{\infty}}$ $\quad \because \frac{1}{\infty} = 0$

$\dfrac{\infty}{2}$

∞ ANS



20) Graph $\Rightarrow$ $f(x) = \begin{cases} x^2 - 4 & ; \quad x \le -3 \\ x+3 & ; \quad -3 < x < 2 \\ -x+2 & ; \quad x \ge 2 \end{cases}$

FOR $x \le -3$; (x^2-4)

at $x \Rightarrow -3 \Rightarrow 5$

at $x = -4 \Rightarrow 12$

at $x \Rightarrow -5 \Rightarrow 21$

at $x = -6 \Rightarrow 32$

FOR $-3 < x < 2$

at $x = -2.9 \Rightarrow 0.1$

at $x = -2 \Rightarrow 1$

at $x = -1 \Rightarrow 2$

at $x = 0 \Rightarrow 3$

at $x = 1 \Rightarrow 4$

at $x = 2.9 \Rightarrow 4.9$

FOR $x \ge 2$

at $x = 2 \Rightarrow 0$

at $x = 3 \Rightarrow -1$

at $x = 4 \Rightarrow -2$

at $x = 5 \Rightarrow -3$

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21) 1

22) -2

23) $\because \lim_{x \to 1^+} f(x) \neq \lim_{x \to 1^-} f(x)$. Limit doesnot exist

24) $\lim_{x \to -1^+} = 2$

$\lim_{x \to -1^-} = 2$

$\Rightarrow \lim_{x \to -1} = 2$

25) $\lim_{x \to 2^+} = 1$, $\lim_{x \to 2^-} = 1$

$\lim_{x \to 2} = 1$

26) (a) $\lim_{x \to 3^+} = 2$

$\lim_{x \to 3^-} = 2$

$f(3) = 3$

Therefore;

$\lim_{x \to 3} f(x) \neq f(3)$

Function is discontinous

(b) * assymptotes
* hole

(c) There is a removal discontinuity at $x = 3$ if the value of $f(3)$ becomes, 2 then the function will be continous.

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27) $f(x) = \begin{cases} 2x-1 ; & x \le 1 \\ -3x+1 ; & x > 1 \end{cases}$ at $x=1$

$f(1) = 2(1)-1$
$= 2-1$
$f(1) = 1$

$\lim_{x \to 1^+} f(x) = \lim_{x \to 1^+} -3x+1$
$= -3(1)+1$
$= -3+1$
$\lim_{x \to 1^+} f(x) = -2$

$\lim_{x \to 1^-} f(x) = \lim_{x \to 1^-} (2x-1)$
$= 2-1$
$= 1$

$\because \lim_{x \to 1^+} f(x) \neq \lim_{x \to 1^-} f(x)$

limit doesnot exist
thus function is discontinous.

28) $f(x) = \begin{cases} \frac{x^2+6x+8}{x+2} ; & x \neq -2 \\ 2 ; & x = -2 \end{cases}$

at $x = -2$

$f(-2) = 2$

$\lim_{x \to -2} f(x) = \lim_{x \to -2} \frac{x^2+6x+8}{x+2}$

$= \lim_{x \to -2} \frac{x^2+2x+4x+8}{x+2}$

$= \lim_{x \to -2} \frac{x(x+2)+4(x+2)}{x+2}$

$= \lim_{x \to -2} \frac{\cancel{(x+2)}(x+4)}{\cancel{(x+2)}}$

applying limit

$= -2+4$

$\lim_{x \to -2} f(x) = 2$

Since $f(-2) = \lim_{x \to -2} f(x)$

Function is continous.

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29) $f(x) = \frac{x^3+8}{x+2}$ at $x=-2$

$f(-2) = \frac{(-2)^3+8}{-2+2}$

$f(-2) = \frac{-8+8}{-2+2}$

$f(-2) = \frac{0}{0}$

function is undefined at $x=-2$
therefore
function is discontinous.

30) $f(x) = \frac{x^3-64}{x-4}$

$f(x) = \frac{x^3-64}{x-4}$

$= \frac{(x)^3-(4)^3}{x-4}$

$= \frac{\cancel{(x-4)}(x^2+4x+16)}{\cancel{x-4}}$

$= x^2+4x+16$

put $x=4$

$= 16 + 4(4) + 16$

$f(4) = 48$

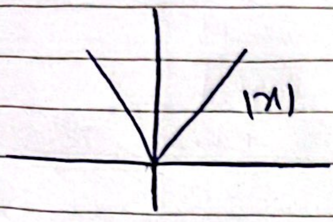
Thus; To remove discontinuity

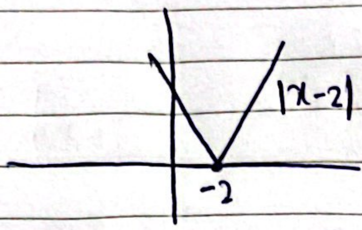
$$f x = \begin{cases} \frac{x^3-64}{x-4} & x \neq 4 \\ 48 & x = 4 \end{cases}$$

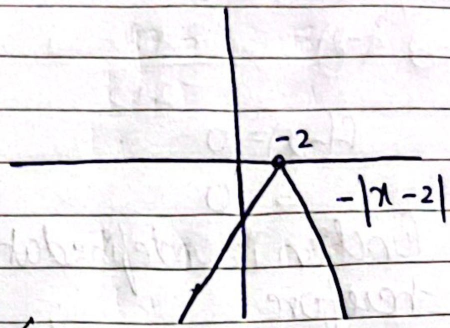
ANS

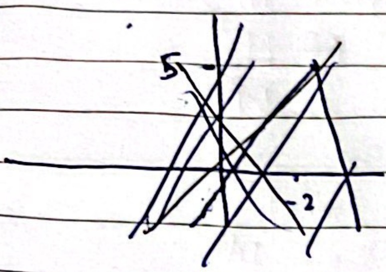
31) Sketch the graph

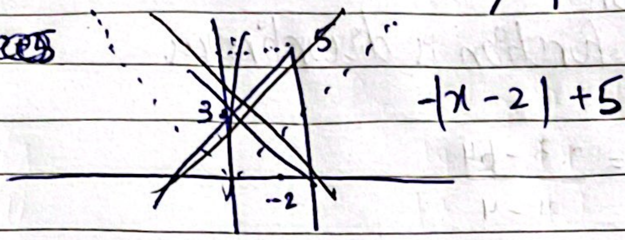
(a) $f(x) = -|x-2| + 5$

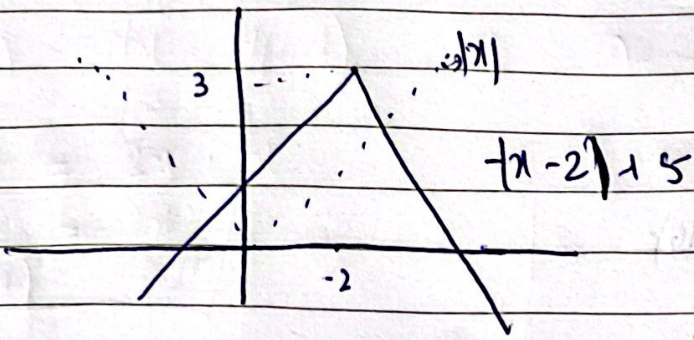




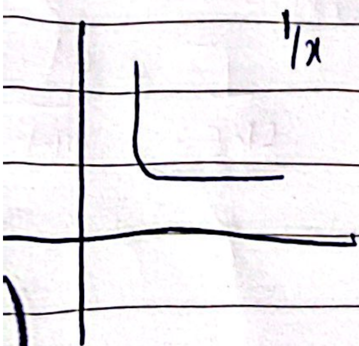


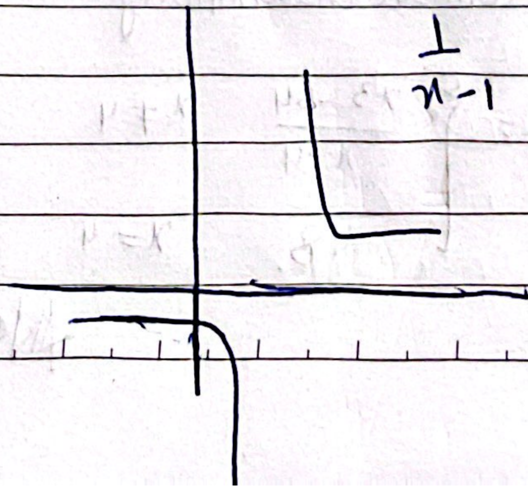


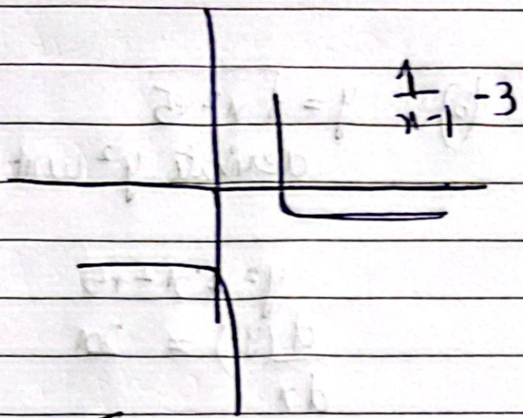




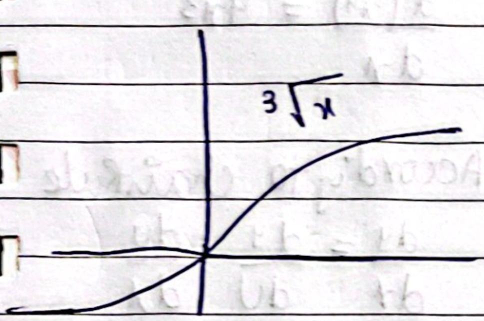
b) $\frac{1}{x-1} - 3$

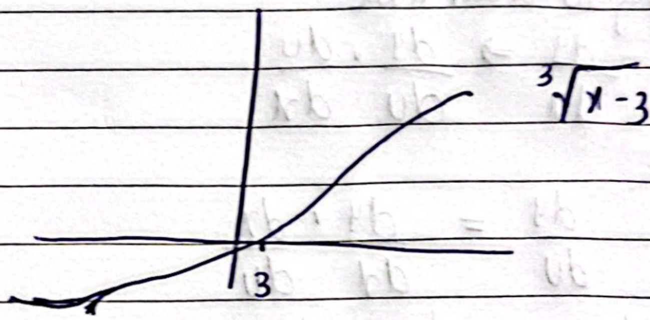


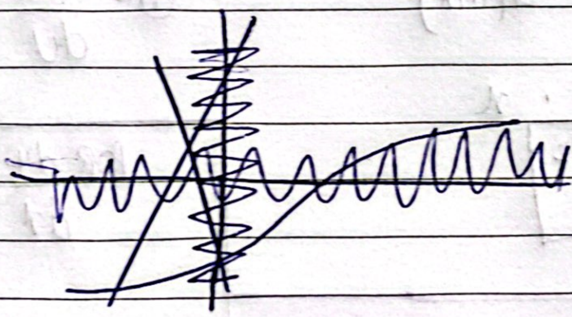


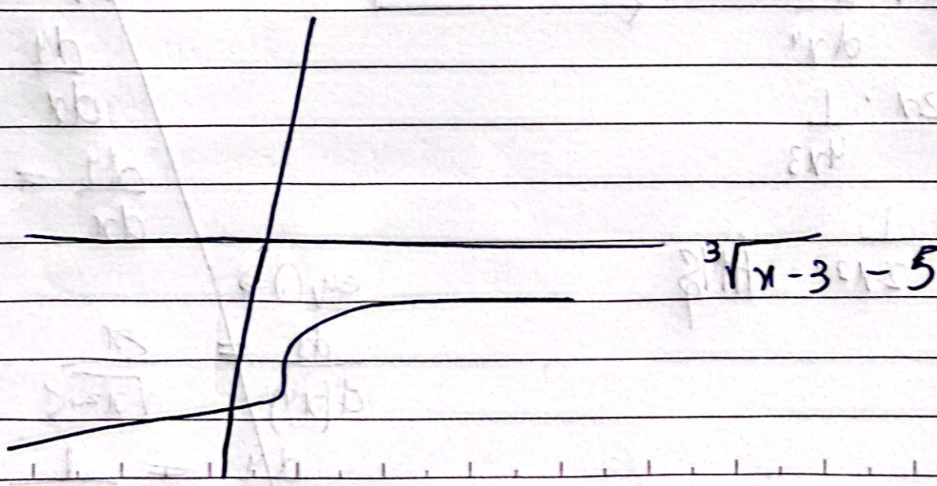


e) $\sqrt[3]{x-3}-5$









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Q → 32

(a) $y = x^2$ wrt $\ln x$

$\because \frac{dy}{dx} = 2x$ (wrt x)

$\frac{d(\ln x)}{dx} \Rightarrow \frac{1}{x}$

According to chain Rule

$\frac{dy}{dx} \Rightarrow \frac{dy}{du} \cdot \frac{du}{dx}$

$\frac{dy}{du} = \frac{dy}{dx} \cdot \frac{dx}{du}$

$\frac{dy}{d(\ln x)} = \frac{dy}{dx} \cdot \frac{dx}{d(\ln x)}$

$= 2x \cdot x$

$\boxed{\frac{dy}{d(\ln x)} = 2x^2}$

(b) $y = \sqrt{x^2+5}$

derivate y^2 wrt x^4

$y^2 = x^2+5$

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

$\frac{d(x^4)}{dx} = 4x^3$

According to chain Rule

$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$

① - $\frac{dy}{du} = \frac{dy}{dx} \cdot \frac{dx}{du}$

FOR $\frac{dy}{dx} \Rightarrow \frac{d}{dx} y^2 = 2x$

~~$\frac{dy}{dx}(\cancel{2}y) = \cancel{2}x$~~

~~$\frac{dy}{dx} = \frac{x}{y}$~~

~~$\frac{dy}{dx} = \frac{x}{\sqrt{x^2+5}}$~~

eq ① ⇒

~~$\frac{dy}{d(x^4)} = \frac{\cancel{x}}{\sqrt{x^2+5}} \cdot \frac{1}{4x^{\cancel{3}2}}$~~

~~$\frac{dy}{d(x^4)} = \frac{1}{4x^2\sqrt{x^2+5}}$~~

$\frac{dy^2}{dx^4} = \frac{dy^2}{dx} \cdot \frac{dx}{dx^4}$

$= 2x \cdot \frac{1}{4x^3}$

$\frac{dy^2}{dx^4} = \frac{1}{2x^2}$ ANS

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(c) Simplify ⇒ $e^{4\ln x}$

$\because b\ln a \Rightarrow \ln a^b$

$e^{\ln x^4}$

x^4 ANS

(d) $y = 3^{x+1}$

differentiate w.r.t x

$$\frac{dy}{dx} = \frac{d}{dx}(3^{x+1}) \quad \because \frac{d}{dx}a^x = a^x \ln a$$

$$= 3^{x+1}\ln(3)$$

$$\frac{dy}{dx} = \cancel{3^{x+1}\{\ln x + \ln 1\}}\; 3^{x+1}\ln 3$$

$\because \ln 1 = 0$

$$\boxed{\frac{dy}{dx} = \ln 3 \cdot 3^{x+1}}$$ ANS

(e) $y = (\ln x)^x$

~~diff w.r.t x~~

$$\cancel{\frac{dy}{dx} = \frac{d}{dx}(\ln x)^x}$$

$$\cancel{= \ln}$$

taking ln bothside

$$\ln y = \ln(\ln x)^x$$

$$\ln y = x\ln(\ln x)$$

diff w.r.t x

$$\frac{1}{y}\frac{dy}{dx} = \frac{d}{dx}\{x\ln(\ln x)\}$$

$$\frac{1}{y}\frac{dy}{dx} = x\frac{d}{dx}\ln(\ln x) + \ln(\ln x)\cancel{\frac{dx}{dx}}$$

$$\frac{1}{y}\frac{dy}{dx} = x\cdot\frac{1}{\ln x}\cdot\frac{1}{x} + \ln(\ln x)$$

$$= \frac{1}{\ln x} + \ln(\ln x)$$

$$\frac{dy}{dx} = y \times \left\{\frac{1}{\ln x} + \ln(\ln x)\right\}$$

$$\frac{dy}{dx} = (\ln x)^x \times \left(\frac{1}{\ln x} + \ln(\ln x)\right)$$

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f) * $y = \sqrt{4x^2+4x}$

$y = (4x^2+4x)^{1/2}$
diff wrt x

$\frac{dy}{dx} = \frac{d}{dx}(4x^2+4x)^{1/2}$

$= \frac{1}{2}(4x^2+4x)^{-1/2} \frac{d}{dx}(4x^2+4x)$

$= \frac{1}{2(\sqrt{4x^2+4x})} \cdot 8x+4$

$= \frac{\cancel{2}(4x+2)}{\cancel{2}\sqrt{4x^2+4x}}$

$\frac{dy}{dx} = \frac{4x+2}{\sqrt{4x^2+4x}}$ ANS

(g) $y = \cos x \sin x$

$\frac{dy}{dx} = \frac{d}{dx} \cos x \sin x$

$\frac{dy}{dx} = \cos \frac{d}{dx} \sin x + \sin \frac{d}{dx} \cos x$

$= \cos x(\cos x) + \sin x(-\sin x)$

$\frac{dy}{dx} = \cos^2 x - \sin^2 x$

ANS

(h) $y = \cos^3(5x)$
diff wrt (x)

$\frac{dy}{dx} = 3\cos^2(5x)\,(5)$

$\frac{dy}{dx} = 15\cos^2(5x)$

(i) $y = \ln(xe^{2x})$
$\because \ln ab = \ln a + \ln b$

$y = \ln x + \cancel{\ln e}^{2x}$

$y = \ln x + 2x$
diff wrt x

$\frac{dy}{dx} = \frac{1}{x} + 2$

$\frac{dy}{dx} = \frac{2x+1}{x}$

(j) $A \Rightarrow \ln(ex) \Rightarrow \cancel{\ln e} + \ln x$

$\frac{dy}{dx} = \frac{1}{x}$

$B \to \ln(2x) \Rightarrow \frac{1}{\cancel{2}x}(\cancel{2}) \Rightarrow \frac{1}{x}$

$C \to \cancel{\ln}(e^{\ln x}) \Rightarrow \ln x \to \frac{1}{x}$

$D \Rightarrow \ln(x e^x) \Rightarrow \ln x + \cancel{\ln e}^x$

$\Rightarrow \ln x + 1$

$\Rightarrow \frac{1}{x} + 1$

Function $\ln(xe^x)$ doesnt have derivative $= \frac{1}{x}$

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k) $f(x) = e^{2x}$ at $x=2$

$y = e^{2x}$

$\frac{dy}{dx} = e^{2x} \cdot 2$

at $x=2$

$\frac{dy}{dx} = e^{4} \cdot 2$

$\because$ slope $= e^{4} \cdot 2$

$m = e^{4} \cdot 2$

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

$e^{4} \cdot 2 (y-0) = x-2$

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

eq of tangent line

L) $y = \ln(6x^2-3)$

diff wrt x

$\frac{dy}{dx} = \frac{d}{dx}\left(\ln(6x^2-3)\right)$

$= \frac{1}{6x^2-3}\left(\frac{d}{dx}(6x^2-3)\right)$

$= \frac{1}{6x^2-3} \; 12x - 0$

$= \frac{12x}{6x^2-3} \rightarrow \frac{\cancel{12}^{4}x}{\cancel{3}(2x^2-1)}$

$\frac{dy}{dx} = \frac{4x}{2x^2-1}$ ANS

m) $e^{4x+2\ln x}$

$\cancel{\ln} e^{4x+2\ln x}$

$4x + 2\ln x$

$\ln x^2 + 4x$ ANS

n) $y = \ln|\sin(3x)|$

diff wrt x

$\frac{dy}{dx} = \frac{1}{\sin 3x} \frac{d}{dx} \sin 3x$

$= \frac{\cos 3x}{\sin 3x} \cdot 3$

$\frac{dy}{dx} = 3 \cot 3x$

ANS

o) $y = 2^{\cos x}$

diff wrt x

$\frac{dy}{dx} = \frac{d}{dx} 2^{\cos x}$

$\because \frac{d}{dx} a^{x} = a^{x} \ln a$

$\frac{dy}{dx} = 2^{\cos x} \ln \cos x \cdot (-\sin$

$\frac{dy}{dx} = -2^{\cos x} \ln(\cos x) \sin$

ANS

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p) $y = \ln\left(\frac{x^2}{e^{6x}}\right)$

$\because \ln\frac{a}{b} = \ln a - \ln b$

$y = \ln x^2 - \cancel{\ln} e^{6x}$

$= \ln x^2 - 6x$

$\because \ln a^b = b\ln a$

$y = 2\ln x - 6x$

diff wrt x

$\frac{dy}{dx} = 2\left(\frac{1}{x}\right) - 6$

$\boxed{\frac{dy}{dx} = \frac{2}{x} - 6}$

ANS

(r) $y = x^3 + 2x^2$

diff wrt x

$\frac{dy}{dx} = 3x^2 + 4x$

ANS

(s) $y = x^{\cot 2x}$

taking ln on both side

$\ln y = \ln x^{\cot 2x}$

$\ln y = \cot(2x) \cdot \ln x$

diff wrt 'x'

$\frac{1}{y}\frac{dy}{dx} = \cot(2x)\left(\frac{1}{x}\right) + \ln x\left(-\operatorname{cosec}^2(2x)\right)2$

$\frac{dy}{dx} = y \times \left\{\frac{\cot 2x}{x} - 2\ln x\left(\operatorname{cosec}^2 2x\right)\right\}$

$\frac{dy}{dx} = x^{\cot 2x}\left\{\frac{\cot 2x}{x} - 2\ln x\left(\operatorname{cosec}^2 2x\right)\right\}$

ANS

q) $y = x^2 \sec(4x)$

$\frac{dy}{dx} = \frac{d}{dx}\left(x^2 \cdot \sec 4x\right)$

$= x^2\frac{d}{dx}(\sec 4x) + \sec 4x\frac{d}{dx}(x^2)$

$= x^2(\sec 4x \tan 4x)(4) + \sec(4x)(2x)$

$y = 4x^2\{\sec 4x \tan 4x\} + 2x\sec 4x$

ANS

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(t) $y = \cos^2(3x) + \sin^2(3x)$

$\because \cos^2\theta + \sin^2\theta = 1$

$y = 1$

$$\boxed{\frac{dy}{dx} = 0 \quad \text{ANS}}$$