

Ex 2.3

Q1

$$(iv) \quad y = x^3 - 8x + 2$$
$$\frac{dy}{dx} = 3x^2 - 8$$

$$(v) \quad y = x^2 + 2x + \frac{1}{x}$$
$$y = x^2 + 2x + x^{-1}$$
$$\frac{dy}{dx} = 2x + 2 - x^{-2}$$
$$= 2x - \frac{1}{x^2} + 2$$

$$(vi) \quad y = 2x^3 + x^2 + \frac{1}{x^2}$$
$$y = 2x^3 + x^2 + x^{-2}$$
$$\frac{dy}{dx} = 6x^2 + 2x - 2x^{-3}$$
$$= 6x^2 + 2x - \frac{2}{x^3}$$

Q2 (iv) $f(x) = x^2 - 5\sqrt{x}$

$$f(x) = x^2 - 5x^{\frac{1}{2}}$$
$$f'(x) = 2x - \frac{5}{2}x^{-\frac{1}{2}}$$
$$= 2x - \frac{5}{2\sqrt{x}}$$

$$(v) \quad f(x) = \frac{3}{\sqrt{x}}$$
$$f(x) = 3x^{-\frac{1}{2}}$$
$$f'(x) = -\frac{3}{2}x^{-\frac{3}{2}}$$
$$f'(x) = \frac{-3}{2\sqrt{x^3}}$$

$$(vi) \quad f(x) = 3x^{-2} + \frac{1}{2\sqrt{x}}$$
$$f(x) = 3x^{-2} + \frac{1}{2}x^{-\frac{1}{2}}$$
$$f'(x) = -6x^{-3} - \frac{1}{4}x^{-\frac{3}{2}}$$
$$= -\frac{6}{x^3} - \frac{1}{4\sqrt{x^3}}$$

Q4 (iv) $f(x) = 6 - \frac{3}{x}$
 $f(x) = 6 - 3x^{-1}$

$$f'(x) = 6 + 3x^{-2}$$
$$f'(x) = 6 + \frac{3}{x^2}$$

(v) $f(x) = 2\sqrt{x} + \sqrt[3]{x}$
 $= 2x^{1/2} + x^{1/3}$

$$f'(x) = 1x^{-1/2} + \frac{1}{3}x^{-2/3}$$
$$= \frac{1}{\sqrt{x}} + \frac{1}{3\sqrt[3]{x^2}}$$

(vi) $f(x) = x^2 + 3 - \frac{4}{x^{-2}}$
 $= x^2 + 3 - 4x^2$

$$f'(x) = 2x - 8x$$
$$= -6x$$

Q5 $y = \sqrt{x}(1 + \sqrt{x})$
 $= \sqrt{x} + x$
 $= x^{1/2} + x$

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

at $x = 4$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{4}} + 1 = \frac{1}{4} + 1 = \frac{5}{4}$$

Q8

$$y = x^{5/2}$$
$$\frac{dy}{dx} = \frac{5}{2} x^{3/2}$$

$$\text{at } x=2 \quad \frac{dy}{dx} = \frac{5}{2} (2)^{3/2}$$
$$= \frac{5}{2} (\sqrt{2^3})$$
$$= \frac{5}{2} (\sqrt{8})$$
$$= \frac{5}{2} (2\sqrt{2})$$
$$= 5\sqrt{2}$$

$$p=5$$

Q9

$$f(x) = x^2 + kx$$
$$f'(x) = 2x + k$$

$$2(2) + k = 3$$
$$-2 + k = 3$$
$$k = 5$$

Q13

$$y = 6 + x - x^2$$
$$\frac{dy}{dx} = 1 - 2x$$

$$\text{at } x=2 \quad : \quad 1 - 2(2) = -3$$

$$(2, 4) \quad m = -3$$
$$y - 4 = -3(x - 2)$$
$$y - 4 = -3x + 6$$
$$3x + y - 10 = 0$$

Q16

$$y = 2x^2 - x - 4$$

$$m = 3$$

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

$$4x - 1 = 3$$

$$4x = 4$$

$$x = 1$$

find y

$$\begin{aligned} y &= 2(1)^2 - (1) - 4 \\ &= 2 - 1 - 4 \\ &= -3 \end{aligned}$$

$$\text{Pt is } (1, -3)$$

Q17

$$y = x^2 + ax$$

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

$$2x + a = 3$$

$$\text{at } x = -1$$

$$2(-1) + a = 3$$

$$-2 + a = 3$$

$$a = 5$$

Q19

$$y = 2x^2 - 8x + 3$$

$$\frac{dy}{dx} = 4x - 8$$

$$Ax - y + 2 = 0$$

$$m = \frac{-4}{-1} = 4$$

$$4x - 8 = 4$$

$$4x = 12$$

$$x = 3$$

find y:

$$y = 2(3)^2 - 8(3) + 3 = -3$$

$$\text{pt is } (3, -3)$$

Q20

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

// to x axis $\Rightarrow M=0$

$$4x + 3 = 0$$

$$4x = -3$$

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

$$\text{Find } y: 2\left(-\frac{3}{4}\right)^2 + 3\left(-\frac{3}{4}\right) = \frac{9}{8} - \frac{9}{4} = -\frac{9}{8}$$

$$\text{pt is } \left(-\frac{3}{4}, -\frac{9}{8}\right)$$

Q21

$$y = a\sqrt{x} + b$$

$$y = ax^{\frac{1}{2}} + b$$

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

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

$$\bullet \frac{a}{2\sqrt{x}} = 3$$

at $x=4$.

$$\frac{a}{4} = 3$$

$$\underline{\underline{a = 12}}$$

(4, 6) into original :

$$6 = 12\sqrt{4} + b$$

$$6 = 24 + b$$

$$\underline{\underline{-18 = b}}$$

Q22

$$y = \frac{3}{x}$$

$(2, \frac{3}{2})$

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

at $x = 2$ slope = $-3(2)^{-2} = -\frac{3}{4}$

Eqn of Tangent at $(2, \frac{3}{2})$ $m = -\frac{3}{4}$

$$y - \frac{3}{2} = -\frac{3}{4}(x - 2)$$

$$4y - 6 = -3x + 6$$

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

Cuts x axis at $y = 0$: $3x = 12$

$$x = 4$$

A (4, 0)

Cuts y axis at $x = 0$:

$$4y = 12$$

$$y = 3$$

B (0, 3)

Area of $\Delta = \frac{1}{2} |(4)(3) - (0)(0)|$

$$= \frac{1}{2} |12| = 6 \text{ sq units.}$$