

1. m

3m<sup>2</sup> + 7  
2 ⇒ 3m<sup>2</sup> / 2  
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(1)  $y = 2x^2$  at point (1, 2)  $\Rightarrow y = 3x^2 - 2x$  at point (1, 2)  
sol.  
 $x_1 = 1, y_1 = 2$   
 $\frac{dy}{dx} = 4x$  where  $x=1$   
so  $m = 4$   
 $x_2 = 2, y_2 = 8$   
 $\frac{dy}{dx} = 6x - 2$   
 $\Rightarrow 12 - 2 = 10$   
 $m = 10$

equation of tangent:  $y - y_1 = m(x - x_1)$   
 $y - 2 = 4(x - 1)$   
 $y - 2 = 4x - 4$   
 $y - 4x + 2 = 0$   
 $y - 4x + 2 = 0$

(ii) equ. of normal:  $y - y_1 = -\frac{1}{m}(x - x_1)$   
 $y - 2 = -\frac{1}{4}(x - 1)$   
 $4y - 8 = -x + 1$   
 $4y + x - 8 - 1 = 0$   
 $4y + x - 9 = 0$   
equation of normal  
 $y - y_1 = -\frac{1}{m}(x - x_1)$   
 $y - 8 = -\frac{1}{10}(x - 2)$   
 $y - 8 = -\frac{x}{10} + \frac{2}{10}$   
multiply through by 10  
 $10y - 80 = -x + 2$   
 $10y + x - 80 - 2 = 0$   
 $10y + x - 82 = 0$

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$y = \sqrt{x}$  at point  $(3, \sqrt{3})$

sol  
 $n = 3, y = \sqrt{3}, y = \sqrt{x}$

$y = x^{-1/2}, y = \sqrt{x}$   
 $\frac{dy}{dx} = -\frac{1}{2}(x)^{-3/2} = -\frac{1}{2\sqrt{x}}$

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

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

Equation of  $y = \sqrt{x}$  is  $y - \sqrt{3} = m(x - 3)$

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

$9y - 3 = -x + 3$

$9y + x - 3 - 3 = 0$

$9y + x - 6 = 0$

Equation of the normal  $y - \sqrt{3} = \frac{1}{\sqrt{3}}(x - 3)$

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

$y - \sqrt{3} = \frac{1}{\sqrt{3}}x - \sqrt{3}$

$y - \sqrt{3} = \frac{1}{\sqrt{3}}x - \sqrt{3}$

$3y - 1 = \frac{1}{\sqrt{3}}x - 1$

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③  $y = x^2$  at point  $(-1, -1)$

Solution

$$y = x^2 \Rightarrow 1 \cdot x^2$$

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

$$m = 3/2$$

Equation of tangent  $y - y_1 = m(x - x_1)$   
 $y - (-1) = (3/2)(x - (-1))$

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

$$2y + 1 = 3x + 3$$

$$2y - 3x + 1 - 3 = 0$$

$$2y - 3x - 2 = 0 \text{ --- eqn 1}$$

Equation of normal  $y - y_1 = -1/m(x - x_1)$

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

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

multiply through with the L.C.M

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

$$6y + 4x + 3 + 4 = 0$$

$$6y + 4x + 7 = 0$$

--- eqn 2

④  $y = 1 + x - x^2$  at point  $(-2, -5)$

Sol

$$y = x^2 + x + 1$$

$$y_1 = -5, x_1 = -2$$

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

Sub: -2 in x since  $x = -2$

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

$$\frac{dy}{dx} = 5 = m$$

Equation of tangent  $y - y_1 = m(x - x_1)$

$$y + 5 = 5(x + 2)$$

$$y + 5 = 5x + 10$$

$$y = 5x + 5$$

--- eqn 1

Equation of normal

$$y - y_1 = -1/m(x - x_1)$$

$$y - (-5) = -1/5(x - (-2))$$

$$y + 5 = -1/5(x + 2)$$

multiply through by 5

$$5y + 25 = -1(x + 2)$$

$$5y + 25 = -x - 2$$

$$5y + x + 25 + 2 = 0$$

$$5y + x + 27 = 0$$