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MTH 104 Assignment

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1)  $y = 2x^2$  at point (1, 2)  
 $m = \frac{dy}{dx} = 4x = 4(1) = 4$

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

Equation of normal  
 $(y - y_1) = -\frac{1}{m}(x - x_1)$   
 $y - 2 = -\frac{1}{4}(x - 1)$   
 $4y - 8 = -x + 1$   
 $4y + x - 8 - 1 = 0$   
 $4y + x - 9 = 0$

2)  $y = 3x^2 - 2x$  at point (3, 8)  
 $m = \frac{dy}{dx} = 6x - 2 = 6(3) - 2 = 10$

Equation of tangent  
 $(y - y_1) = m(x - x_1)$   
 $(y - 8) = 10(x - 3)$

Equation of normal  
 $(y - y_1) = -\frac{1}{m}(x - x_1)$   
 $(y - 8) = -\frac{1}{10}(x - 3)$

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

Equation of a tangent  
 $y - y_1 = m(x - x_1)$   
 $y - (-\frac{1}{2}) = 3(x - 1)$   
 $y + \frac{1}{2} = 3x - 3$   
 $2y + 1 = 6x - 6$  (cross multiply)  
 $4y + 2 = 6x - 6$

$$3(9-7y+3x-18)=0$$

$$9y+x-6=0$$

equation of normal

$$y-y_1 = -\frac{1}{m}(x-x_1)$$

$$y-1 = 9(x-3)$$

1)

$$3y-1 = 9x-27$$

$$3y-1 = 27x-81$$

$$3y-27x-1+81=0$$

$$3y-27x+80=0$$

$$x+3=-2x-2$$

$$2x+5=0$$

$$\frac{1}{3}$$

$$\frac{1}{3} = -\frac{1}{9}$$

$$4y - 6x + 2 = 0$$

$$4y - 6x - 4 = 0 \quad (\text{divide both sides by 2})$$

$$2(2y - 3x - 2) = 0$$

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

equation of normal  
 $y - y_1 = -\frac{1}{m}(x - x_1)$

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

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

$$\frac{2y + 1}{2} = \frac{-2x - 2}{3} \quad (\text{cross multiply})$$

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

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

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

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

$y = 1 + x - x^2$  at point  $(-1, -\frac{1}{2})$   
 $\frac{dy}{dx} = 1 - 2x = 1 - 2(-1) = 3$

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

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

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

$$\frac{2y + 1}{2} = 3x + 3$$

$$2y + 1 = 6x + 6$$

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

$$2y + 1 = 6x + 6$$

$$2y - 6x + 1 - 6 = 0$$

$$2y - 6x - 5 = 0$$

equation of normal  
 $y - y_1 = -\frac{1}{m}(x - x_1)$

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

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

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

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

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

$$6y + 3 = -2x - 2$$

$$6y + 2x + 3 + 2x + 5 = 0$$

b)  $y = \frac{1}{x}$  at point  $(3, \frac{1}{3})$

$$m = \frac{dy}{dx} = -\frac{1}{x^2} = -\frac{1}{(3)^2} = -\frac{1}{9}$$

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

$$y - \frac{1}{3} = -\frac{1}{9}(x - 3)$$

$$y - \frac{1}{3} = -\frac{1}{9}x + \frac{1}{3}$$

$$\frac{3y - 1}{3} = \frac{-x + 3}{9}$$

$$9(3y - 1) = 3(-x + 3)$$

$$27y - 9 = -3x + 9$$

$$27y + 3x - 9 - 9 = 0$$