

NAME:
EPT:
Matrikno:
course code

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Medicine and Surgery
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Mat 104 (Equation of tangent and normal)

- 1) $y = 2x^2$ at point $(1, 2)$
- 2) $y = 3x^2 - 2x$ at point $(2, 8)$
- 3) $y = \frac{x^3}{2}$ at point $(-1, -\frac{1}{2})$
- 4) $y = 1 + x - x^2$ at point $(-2, -5)$
- 5) $y = \frac{1}{x}$ at point $(3, \frac{1}{3})$

solution

1) $y = 2x^2$ at point $(1, 2)$

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

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

$$m = 4x, m = 4(1) = 4$$

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

$$y - 2 = 4(x - 1)$$

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

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

$$y - 4x = -2$$

For normal equation

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

$$y - 2 = \frac{-1}{4}(x - 1)$$

Cross multiply

$$4y - 8 = -x + 1$$

$$4y + x = +1 + 8$$

$$4y + x = 9$$

$$2) y = 3x^2 - 2x \text{ at point } (2, 8)$$

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

$$m = \frac{dy}{dx} \Big|_{x=2}$$

$$m = 6x - 2, m = 6(2) - 2, m = 10$$

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

$$y - 8 = 10(x - 2)$$

$$y - 8 = 10x - 20$$

$$y - 10x = -20 + 8$$

$$y - 10x = -12$$

For a normal equation

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

$$y - 8 = \frac{-1}{10}(x - 2)$$

Cross multiply

$$10y - 80 = x - 2$$

$$10y + x = 2 + 80$$

$$10y + x = 82$$

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$$3 \quad y = \frac{x^3}{2} \text{ at points } (-1, -\frac{1}{2})$$

$$\frac{dy}{dx} = \frac{3x^2}{0} = \text{undefined}$$

$$4) \quad y = 1 + x - x^2 \text{ at point } (-2, -5)$$

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

$$m = 1 - 2(-2)$$

$$m = 1 + 4 = 5$$

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

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

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

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

$$y - 5x = 10 - 5$$

$$y - 5x = 5$$

for normal equation

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

$$y - (-5) = \frac{-1}{5}(x - (-2))$$

$$y + 5 = -\frac{1}{5}(x + 2)$$

Cross multiply

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

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

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

$$5y + x = -27$$

5 $y = 1/x$ at points $(3, 1/3)$

$$y = x^{-1}$$

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

$$m = -3^{-2} = -1/3^2 \quad m = 1/9$$

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

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

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

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

$$27y + 3x = 18$$

For the normal equation

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

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

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

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

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

$$\frac{3y - 1}{3} = 9x - 27$$

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

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

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

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