Course code: Maths 104
Assignment title: Equation of tangent and normal for Medicine student

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

Soln

$y = 2x^2$

$m = dy/dx = 4x$

$dy/dx \big|_{x=1} = 4(1) = 4$

$m = 4$

Equation of tangent

$x_1 = 1, y_1 = 2$

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

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

$y - 2 = 4x - 4$

$4x - y = 4 - 2$

$4x - y = 2$

$4x - y - 2 = 0$

Equation of the normal

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

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

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

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

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

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

$$4y+x=9$$

$$4y+x-9=0$$

(2) $y=3x^2-2x$ (x, y) $(2, 8)$.

$$dy/dx = 6x-2$$

$$dy/dx\Big|_{x=2} = 6(2)-2$$

$$=12-2=10$$

$$m=10$$

Equation of target

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

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

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

$$10x-y=12$$

$$10x-y-12=0$$

Equation of normal

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

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

$10(y - 8) = -1(x - 2)$

$10y - 80 = -x + 2$

$10y + x = 80 + 2$

$10y + x - 82 = 0$

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

$x \quad y$

$y = \frac{x^3}{2} = \frac{u}{v}$, $= \frac{v \cdot du/dx - u \cdot dv/dx}{v^2}$

$\frac{2 \cdot 3x^2 - x^3 \cdot 0}{2^2}$

$y = \frac{6x^2}{4}$, $dy/dx \Big|_{x=-1} = \frac{6(-1)^2}{4} =$

$m = 3/2$

Equation of tangent

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

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

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

$y + 1/2 = 3/2\,x + 3/2$

~~$y - 3/2x = 1$~~

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

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

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

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

Equation of normal

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

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

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

$y + 1/2 = -2/3x + 2/3$.

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

$\frac{-3+4}{6} = \frac{1}{6}$

$y - \frac{2}{3}x - \frac{1}{6} = 0$ //

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

$\frac{dy}{dx} = 0 + 1 - 2x$

$\frac{dy}{dx}\Big|_{x=-2} = 1 - 2(-2) = 1 + (+4)$

$m = 5$

Equation of tangent

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

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

$y + 5 = 5x + 10$

$y - 5x = -5 + 10$

$y - 5x + 5 = 0$

Equation of normal

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

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

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

$5y + 25 = -x - 2$

$5y + x = -25 - 2$

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

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

$\frac{dy}{dx} = \frac{1}{x}$ ~~$\frac{dy}{dx}$~~ $\frac{u'}{v} = \frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{v^2}$

$= \frac{x \cdot 0 - 1 \cdot 1}{x^2} = \frac{-1}{x^2}$

$dy/dx \Big|_{x=3} = \frac{-1}{3^2} = -1/9$

$\therefore m = -1/9$ //

Equation of tangent

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

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

$y - 1/3 = -1/9 x + 1/3$

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

$y + 1/9 - \frac{2}{3} = 0$ //

Equation of normal

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

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

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

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

~~$y - 9x =$~~

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

$\frac{81 - 1}{3} = \frac{80}{3}$

$9x - y - \frac{80}{3} = 0$ //