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• Find equation of the tangent & equation of the normal.

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

$\Rightarrow \frac{dy}{dx} = 4x \Rightarrow m = \frac{dy}{dx}\Big|_{x=1} \Rightarrow 4(1) = 4$ //

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

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

$y - 2 = x - 1 \Rightarrow y - x - 1 = 0$ / → eqn of tangent.

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

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

$\Rightarrow y + x - 3 = 0$ / → eqn of normal.

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

$\Rightarrow \frac{dy}{dx} = 6x - 2 \Rightarrow m = \frac{dy}{dx}\Big|_{x=2} \Rightarrow 6(2) - 2 = 12 - 2 = 10$ //

TANGENT

$y - y_1 = m(x - x_1) \Rightarrow y - 8 = 10(x - 2) \Rightarrow y - 8 = 10x - 20$

$\Rightarrow y - 10x + 12 = 0$ //

NORMAL

$y - y_1 = \frac{-1}{m}(x - x_1) \Rightarrow y - 8 = \frac{-1}{10}(x - 2) \Rightarrow 10y - 80 = -x + 2$

$\Rightarrow 10y + x - 82 = 0$ //

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

$\Rightarrow \frac{dy}{dx} = \frac{3x^2}{2} \Rightarrow m = \frac{dy}{dx}\Big|_{x=-1} \Rightarrow \frac{3(-1)^2}{2} = \frac{3}{2}$ //

TANGENT

$y - y_1 = m(x - x_1) \Rightarrow y - (-\frac{1}{2}) = \frac{3}{2}(x - (-1)) \Rightarrow y + \frac{1}{2} = \frac{3x}{2} + \frac{3}{2}$

[Multiply both sides by 2]

$\Rightarrow 2y + 1 = 3x + 3 \Rightarrow 2y - 3x - 2 = 0$ //

NORMAL

$y - y_1 = \frac{-1}{m}(x - x_1) = y + \frac{1}{2} = \frac{-1}{-1}(x + 1) \Rightarrow y + \frac{1}{2} = x + 1 \Rightarrow 2y + 1 = 2x + 2$

$\Rightarrow 2y - 2x - 1 = 0$ /

4) $y = 1+x-x^2$ at point $(-3, -5)$

$\Rightarrow y = -x^2+x+1 \Rightarrow \frac{dy}{dx} = -2x+1 \Rightarrow m = \frac{dy}{dx}\Big|_{x=-3} \Rightarrow -2(-3)+1 = 4+1 = 5$

TANGENT

$y-y_1 = m(x-x_1) \Rightarrow y+5 = 5(x+3) \Rightarrow y+5 = 5x+10 \Rightarrow y-5x-5 = 0$

NORMAL

$y-y_1 = \frac{-1}{m}(x-x_1) \Rightarrow y+5 = \frac{-1}{5}(x+3) \Rightarrow 5y+25 = -x-3$

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

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

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

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

TANGENT

$y-y_1 = m(x-x_1) \Rightarrow y-1/3 = -1/9(x-3)$

[Multiply by 9]

$\Rightarrow 9y-3 = -x+3$

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

NORMAL

$y-y_1 = \frac{-1}{m}(x-x_1) \Rightarrow y-1/3 = \frac{-1}{-1/9}(x-3)$

$\Rightarrow y-1/3 = 9(x-3)$

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

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

$\Rightarrow 3y-27x-80 = 0$