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

Solution

$y = 2x^2$

$y = 4x$

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

$m = dy/dx \,/\, x = x_1$

$m = dy/dx \,/\, x = 1 = 4(1) = 4$

$m = 4$

a.) Equation of the tangent

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

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

$y - 2 = 4x - 4$

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

$y + 2 - 4x = 0$

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

b.) Equation of the normal

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

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

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

$4y - 8 = -x + 1$

$4y - 8 - 1 + x = 0$

$4y + x - 9 = 0$

2.) $y = 3x^2 - 2x$ at point

$y = 3x^2 - 2x$

$y = 6x - 2$

$dy/dx = 6x - 2$

$m = dy/dx \,/\, x = x_1$

$m = dy/dx \,/\, x = 2 = 3(2)^2 - 2 = 10$

$m = 10$

a.) Equation of the tangent

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

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

$y - 8 = 10x - 20$

$y - 10x - 8 + 20 = 0$

$y - 10x + 12 = 0$

b.) Equation of the normal

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

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

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

$10y - 80 = -x + 2$

$10y + x - 80 - 20 = 0$

$10y + x - 82 = 0$

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

$y = x^{3/2}$

$y = 3x^{2/2}$

$dy/dx = 3x^2/2$

$m = dy/dx / x = x_1$

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

$m = 3/2$

a) Equation of the tangent

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

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

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

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

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

$y - 1 = 3x/2$

$2(y-1) = 3x$

$2y - 2 - 3x = 0$

$2y - 3x - 2 = 0$

b) equation of the normal

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

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

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

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

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

$3y + 2x + 3/2 + 2 = 0$

$2y + 2x + 7/2 = 0$

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

$y = 1 + x - x^2$

$y = 1 - 2x$

$dy/dx = 1 - 2x$

$m = dy/dx / x = x_1$

$m = dy/dx / x = -2 = 1 - 2(-2) = 5$

$m = 5$

a.) Equation of the tangent

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

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

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

$y + 5 = 5x + 10$

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

$y - 5x - 10 = 0$

b.) Equation of the normal

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

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

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

$5y + 10 = -x - 2$

$5y + 10 = -x - 2$

$5y - x + 10 + 2 = 0$

$5y - x + 12 = 0$

5.)

5) $y = \frac{1}{x}$ at the point $(3, 1/3)$

$y = 1/x$

$y = 1$

$m = 1$

a) equation of the target

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

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

$y - 1/3 = x - 3$

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

$y - x + 8/3 = 0$

b) equation of the normal

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

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

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

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

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

$y + x - 10/3 = 0$