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Find the equation of the tangent and equation of the normal

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

$m = \frac{dy}{dx}\Big|_{x=1}$

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

$m = 2(1)^2$

$m = 2$

a) equation of tangent

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

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

$y - 2 = 2x - 2$

$y - 2x = -2 + 2$

$y - 2x = 0$

b) equation of the normal

$m_1 = \frac{-1}{m} = m_1 = \frac{-1}{2}$

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

$y - y_2 = \frac{-1}{2}(x - 1)$

$2y - 4 = -x + 1$

$2y + x = 1 + 4$

$2y + x = 5$

$2y + x - 5 = 0$

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

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

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

$m = 3(2)^2 - 2(2)$

$m = 12 - 4$

$m = 8$

a) Equation of tangent

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

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

$y - 8x = -16 + 8$

$y - 8x = -8$

$y - 8x + 8 = 0$.

b) equation of the normal

$m_1 = \frac{-1}{m}$ $m_1 = \frac{-1}{8}$

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

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

$8y - 64 = -x + 2$

$8y + x = 2 + 64$

$8y + x = 66$

$8y + x - 66 = 0$

3) $y = x^{3/2}$ at the points $(-1, -1/2)$

$m = \frac{dy}{dx}\Big|_{x=-1}$

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

$m = (-1)^{3/2}$

$m = -1/2$

a) equation of the tangent

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

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

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

$2y + 1 = -x - 1$

$2y + x = -1 - 1$

$2y + x = -2$

$2y + x + 2 = 0$

b) equation of the normal

$m_1 = \frac{-1}{m} = m_1 = -1 \div \frac{-1}{2}$

$m_1 = 2$

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

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

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

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

multiply thru by 2

$2y + 1 = 4x + 4$

$2y - 4x = 4 - 1$

$2y - 4x - 3 = 0$

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

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

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

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

$m = -5$

a) equation of the tangent

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

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

$y + 5 = -5x - 10$

$y + 5x = -10 - 5$

$y + 5x = -15$

$y + 5x + 15 = 0$

b) equation of the normal

$m_1 = \frac{-1}{m} = m_1 = \frac{-1}{-5}$

$m = \frac{1}{5}$

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

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

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

$5y + 25 = x + 2$

$5y - x = 2 - 25$

$5y - x = -23$

$5y - x + 23 = 0$

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

$m = \frac{dy}{dx}\Big|_{x=3}$

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

$m = \frac{1}{3}$

a) equation of the tangent

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

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

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

$3y - 1 = x - 3$

$3y - x = -3 + 1$

$3y - x = -2$

$3y - x + 2 = 0$

b) equation of the normal

$m_1 = \frac{-1}{m}$ $m_1 = -1/1/3$

$m_1 = -3$

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

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

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

multiply through by 3

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

$3y + 9x = 27 + 1$

$3y + 9x = 28$

$3y + 9x - 28 = 0$