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

$dy/dx = 4x$

at $x = 1$

$m = 4(1) = 4$

$dy/dx|_{x=1} = 4$

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

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

$y - 2 = 4x - 4$

$y - 4x + 2 = 0$ (equation of tangent)

For Equation of Normal

$y - y_1 = -1/m_1(x - x_1)$

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

$y - 2 = -1/4x + 1/4$

$4y - 8 = -x + 1$

$4y + x - 9 = 0$ is the equation of the normal

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

$dy/dx = 6x - 2$

at $x = 2$

$m = 6(2) - 2$

$m = 10$

$dy/dx|_{x=2} = 10$

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

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

$y - 8 = 10x - 20$

$y - 10x + 12 = 0$

Equation of tangent

$y - y_1 = -1/m_1(x - x_1)$

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

$10y - 80 = -x + 2$

$10y - x - 82 = 0$ is the equation of the normal

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

$dy/dx = \dfrac{V\,du/dx - u\,dx/dx}{V^2}$ let $v = 2$ and $u = x^3$

$= \dfrac{2 \times 3x^2 - x^3 \cdot 0}{2^2}$

$= \dfrac{6x^2 - 0}{4}$ $\therefore dy/dx = 6x^2/4$

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

$m = 6/4 = 3/2$

$y + 1/2 = 3/2(x + 1)$ (Divide through by 2)

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

$2y - 3x = 0$

$2y - 3x = 0$

$\therefore$ Equation of the tangent is $2y - 3x = 0$

$y - y_1 = -1/m_1(x - x_1)$

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

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

$y + 2/3x + 7/6 = 0$

Divide through by 6

$6y + 4x + 7 = 0$ is the equation of the normal

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

$dy/dx = -2x + 1$

$m = -2(-2) + 1$ when $x = -2$

$m = 4 + 1 = 5$

$dy/dx\,|_{x=-2} = 5$

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

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

$y + 5 = 5x + 10$

$y - 5x + 5$ is the equation of the tangent

$y - y_1 = -1/m_1 (x - x_1)$

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

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

$5y + 25 = -x - 2$

$5y + x + 25 + 2 = 0$

$5y + x + 27 = 0$ is the equation of the normal

5 $y = 1/x \quad (3, 1/3)$

$y = x^{-1}$

$dy/dx = -x^{-2}$

$m_1 = (3)^{-2} = -1/9$

$dy/dx|_{x=3} = -1/9$

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

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

$9y - 3 = -1(x - 3)$

$9y + x - 6 = 0$ is the equation of the tangent

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

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

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

$3y - 1 = 27(x - 3)$

$3y - 1 = 27x - 81$

$3y - 27x + 80$ is the equation of the normal