5) $y = \frac{x^5}{2}$ at point $(-1, -\frac{1}{2})$

slope of tangent $= \frac{dy}{dx} = m$

$m = \frac{5}{2}x^3, x = -1$

$m = \frac{5}{2} \times (-1)^2 = \frac{+5}{2}$

Equation of Tangent

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

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

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

multiply both sides by 2

$2y + 1 = 5x + 5$

$2y = 5x + 2$

3b) Slope of normal $= -1/\frac{5}{2} = -\frac{2}{5}$

Equation of normal

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

multiply both sides by LCM of 5 and 2

$6y + 5 = -4x - 4$

$6y = -4x - 9$

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

Slope of Tangent $= dy/dx = m$

$= 6x - 2$

at $x = 2$

$m = 10$

Equation of Tangent

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

$y - 8 = 10x - 20$

$y = 10x - 12$

2b) slope of Normal $= \frac{-1}{10}$

Equation of Normal

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

$10y - 80 = -x + 2$

$10y = -x + 82$

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

Slope of tangent $= \frac{dy}{dx} = m$

$m = 4x$, $x = 1$

$m = 4$

Equation of the tangent

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

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

$y - 2 = 4x - 4$

$y = 4x + 1$

b) The normal is perpendicular to the tangent: normal $= -1/m$

normal $= -1/4$

Equation of the normal

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

$4y - 8 = -x + 1$

$4y = -x + 9$

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

Slope of tangent $= \frac{dy}{dx} = m$

$m = 1 - 2x$ at $x = -2$

$m = 1 - 2(-2) = 5$

Equation of tangent

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

$y + 5 = 5x + 10$

$y = 5x - 5$

4b) Slope of Normal $= -1/5$

Equation of normal

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

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

$5y + 25 = -x - 2$

$5y = -x - 27$

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

a) slope of tangent $= \frac{dy}{dx} = m$

$m = -x^{-2}$ at $x = 3$

$m = -(3)^{-2} = \frac{-1}{9}$

Equation of tangent

$y - y_3 = 1/9 (x - 3)$

$9y - 3 = -x + 3$

$9y = -x + 6$

b) slope of normal $= \frac{-1}{-1/9} = 9$

Equation of normal

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

multiply both sides by 3

$3y - 1 = 27x - 81$

$3y = 27x + 80$