1) a $y = 2x^2$ at pt $(1, 2)$

Solution

Slope of tangent $= dy/dx = m$

$\therefore m = 4x, \quad x = 1$

$m = 4$

Equation of the tangent

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

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

$y - 2 = 4x - 4$

$y = 4x - 4 + 2$

$y = 4x - 2$

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

b The normal is perpendicular to the tangent

$\therefore m_{normal} = -1/m$

$M_{normal} = \cancel{-1/4} \; -1/4$

$y - 2 = \frac{-1}{4}(x - 1)$

$4y - 8 = -x + 1$

$4y = 9 - x$

$\therefore 4y + x - 9 = 0$

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

a) Slope of tangent $= dy/dx = m$
$= 6x - 2$

at $x = 2$

$m = 10$

Equation of Tangent

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

$y - 8 = 10x - 20$

$y = 10x - 12$

$\therefore \quad y - 10x + 12 = 0$

b) Slope of the normal $= -1/10$

Equation of normal

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

$10y - 80 = -x + 2$

$10y = -x + 82$

$\therefore \quad 10y + x - 82 = 0$

3) $y = x^3/2$ at point $(-1, -1/2)$

Sol: Slope of the Tangent $= dy/dx = m$

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

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

Equation of Tangent

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

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

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

Multiply both sides by 2

$2y + 1 = 3x + 3$

$2y = 3x + 4$

$\therefore 2y + 3x - 4 = 0$

Slope of Normal $= -1/3/2 = -2/3$

Equation of Normal

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

Multiply both sides by LCM of 3 and 2

$6y + 3 = -4x + 4$

$6y = -4x - 1$

$\therefore 6y + 4x + 1 = 0$

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

a) Slope of Tangent $= \frac{dy}{dx} = m$

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

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

Equation of Tangent

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

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

$y = 5x - 5$

$\therefore$ ~~y+~~ $y - 5x + 5 = 0$

b Slope of the normal $= -1/5$

Equation of ~~the~~ normal

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

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

$5y + 25 = -x - 2$

$5y = -x - 27$

$\therefore$ $5y - x + 27 = 0$

5)

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

a Slope of Tangent $= dy/dx = m$

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

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

Equation of the tangent

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

$9y - 3 = -x + 3$

$9y = -x + 6)$

$\therefore$ ~~$9y + x - 6 = 0$~~ $x + 9y - 6 = 0$

b Slope of Normal $= \dfrac{-1}{-1/9} = 9$

Equation of normal

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

Multiply both sides by 3

~~$3y - 1 = 27x - 8)$~~ $9y - 3 = 1(x-3)$

~~$3y = 27x + 80$~~ $9y - 3 = x - 3$

$\therefore$ $x - 9y = 0$ //