$= m = 10$

For the equation of the tangent

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

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

$y - 8 = 10x - 20$

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

$y - 10x + 12 = 0$

For the equation of the normal

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

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

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

$10y - 80 = -x + 2$

$10y + x - 80 - 2 = 0$

$10y + x - 82 = 0$

3. $y = x^{5/2}$ at the Point $(-1, -1/2)$

To the normal:

$y = x^{5/2}$

$\frac{dy}{dx}$ of $\frac{1}{2}x^5 = \frac{3x^2}{2}$

$\left.\frac{dy}{dx}\right|_{x=-1} = \frac{3}{2}(-1)^2 = \frac{3}{2} \times 1$

$m = dy/dx = 3/2$

For the equation of the tangent

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

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

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

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

(multiply both sides by 2)

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

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

$2y + 1 = 3x + 3$

$2y - 3x + 1 - 3 = 0$

$2y - 3x - 2 = 0$

For the equation of the normal:

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

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

$y + \frac{1}{2} = -\frac{2}{3}(x+1)$

(multiply both sides by 6)

$6(y + 1/2) = 6(-2/3(x+1))$

$6y + 3 = -4(x+1)$

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

$6y + 4x + 3 + 4 = 0$

$\therefore 6y + 4x + 7 = 0$

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

For normal;

$y = 1 + x - x^2$

$\frac{dy}{dx} = 1 - 2x$

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

$= 1 + 4$

$m_1 = dy/dx = 5$

For equation of tangent:

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

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

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

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Assignment

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

For the normal:

$y = 2x^2$

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

$\frac{dy}{dx}\Big|_{x=1} = 4(1) = 4$

For the equation of tangent:

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

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

$y - 2 = 4x - 4$

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

$y - 4x + 2 = 0$

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

For the equation of the normal:

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

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

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

$4y - 8 = -x + 1$

$4y + x - 9$

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

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

For the normal:

$y = 3x^2 - 2x$

$\frac{dy}{dx} = 6x - 2$

$\frac{dy}{dx}\Big|_{x=2} = 6(2) - 2$

$dy/dx = 10$

$y+5 = 5x+10$

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

$y=5x-5=0$

For equation of normal

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

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

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

$5(y+5) = -1(x+2)$ (multiply through by 5)

$5y+25 = -x-2$

$5y+x+27=0$

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

~~For~~ the normal

$x=3, y=1/3$

$y = 1/x$

$y = x^{-1}$

$\frac{dy}{dx} = x^{-2}$

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

For the equation of the tangent

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

$(y-1/3) = +1/9(x-3)$ (multiply through by 9)

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

$9y-3 = -x+3$

$9y+x-3-3=0$

$9y+x-6=0$

For equation of the normal

$y-y_1 = -1/m(x_0-x_1)$

$(y-1/3) = 9(x-3)$ (multiply through by 3)

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

$\frac{27}{6}$

$3y - 1 = 27x - 3$

$3y - 1 = 27x - 72$

$3y - 1 = 27x - 81$

$3y - 27x - 1 + 81 = 0$

$\therefore 3y - 27x + 80 = 0$