Find (a) the equation of the tangent
(b) the equation of the normal

1. $y = 2x^2$ at point $(1, 2)$
   x_1, y_1

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

$\frac{dy}{dx} = 4(1)$

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

$y = mx + c$
$= 4(1)$

$y - y_1 = m(x - x_1)$
$y - 2 = 4(x - 1)$
$y = 4x - 4 + 2$

∴ equation of the tangent = $y = 4x - 2$

$m_{tangent} \times m_{normal} = -1$

$\frac{4 \times m_{normal}}{4} = \frac{-1}{4}$

$m_{normal} = -1/4$

equation of the normal

$y - y_1 = m(x - x_1)$
$y - 2 = -1/4(x - 1)$
$y = -1/4x + 1/4 + 2$
$y = -1/4x + 9/4$

2. $y = 3x^2 - 2x$ at point $(2, 8)$
   x_1, y_1

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

$y - y_1 = m(x - x_1)$
$y - 8 = 6x - 2(x - 2)$
$y - 8 = 6x^2 - 2x - 12x + 4$
$y = 6x^2 - 14x + 4 + 8$
$y = 6x^2 - 14x + 12$

∴ equation of the tangent $= y = 6x^2 - 14x + 2$

Math assign

equation of the normal.

m tangent × m normal = -1

$\frac{6x-2}{6x-2} \times m_{normal} = \frac{-1}{6x-2}$

$m_{normal} = \frac{-1}{6x-2}$

~~m normal~~ =

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

$y - 8 = \frac{-1}{6x-2}(x - 2)$

$y - 8 = \left(\frac{-1}{6x-2}\right)x + \left(\frac{2 \cdot -1}{6x-2}\right) - 2$

$y = \left(\frac{-1}{6x-2}\right)x + \left(\frac{-1}{6x-2}\right) - 2 + 8$

$y = \frac{-x}{6x-2} + \frac{2}{6x-2} + 8$

$y = \frac{-x}{6x-2} + \left(\frac{2 + 48x + 16}{6x + 2}\right)$

$y = \frac{-x}{6x-2} + 13$

∴ equation of the normal = $y = \frac{-x}{6x-2} + 13$

3) $y = x^3/2^x$ at point $C(\overset{x_1}{-1}, \overset{y_1}{-1/2})$

$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

$\frac{dy}{dx} = \frac{2(3x^2) - x^3(1)}{2^2}$

$\frac{dy}{dx} = \frac{6x^2 - x^3}{4}$ $\frac{6x^2}{4}$

NO. 3

3) $y = \frac{x^3}{2}$ at point $(-1, -\frac{1}{2})$

$$\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$$

$$\frac{dy}{dx} = \frac{6x^2}{4}$$

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

$$y - (-\tfrac{1}{2}) = \frac{6x^2}{4}(x - (-1))$$

$$y + \tfrac{1}{2} = \frac{6x^3}{4}(x + 1)\ \frac{6x^3}{4} + \frac{6x^2}{4}$$

$$y = \frac{6x^3 + 6x^2}{4} - \frac{1}{2}$$

$$y = \frac{6x^3 + 6x^2 - 2}{4}$$

eqn to the tangent $= y = \frac{6x^3 + 6x^2 - 2}{4}$

m normal $= -1 /$ m tangent

m normal $= -1 \div \frac{6x^3 + 6x^2 - 2}{4}$ $\frac{6x^2}{4}$

m normal $= \frac{6x^3 + 6x^2 - 2}{-4}$ $\frac{6x^2}{-4}$

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

$$y - (-\tfrac{1}{2}) = \frac{6x^2}{-4}(x - (-1))$$

$$y = \frac{6x^3}{-4} + \frac{6x^2}{-4} - \frac{1}{2}$$

$$y = \frac{6x^3 + 6x^2}{-4} - \frac{1}{2}$$

$$y = \frac{-6x^3 + 6x^2 - 2}{4}$$

eqn to the normal $y = \frac{-6x^3 - 6x^2 - 1}{2}$

NO. 4

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

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

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

$y - (-5) = 1 - 2x\,(x - (-2))$

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

$y + 5 = x - 2x^2 + 2 - 4x$

$y = x + 2 - 2x^2 - 4x - 5$

$y = -2x^2 - 3x - 3$

∴ eqn of the tangent $= y = -2x^2 - 3x - 3$

$m_{tangent} \times m_{normal} = -1$

$m_{normal} = \frac{-1}{1 - 2x} = \frac{1 - 2x}{1} \times \frac{1}{-1}$

$m_{normal} = \frac{1 - 2x}{-1}$

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

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

$y + 5 = \left(\frac{1 - 2x}{-1}\right)x + \frac{2 - 4x}{-1}$

$y = \left(\frac{1 - 2x}{-1}\right)x + \frac{2 - 4x}{-1} - 5$

$y = \frac{x - 2x^2 + 2 - 4x}{-1} - 5$

$y = \frac{-2x^2 - 3x + 2}{-1} - \frac{5}{1}$

$y = -x + 2x^2 - 2 + 4x - 5$

$y = 2x^2 + 3x - 7$

∴ equation of the normal $= y = 2x^2 + 3x - 7$

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

$$\frac{dy}{dx} = \frac{V\frac{dy}{dx} - U\frac{dv}{dx}}{V^2} = \frac{x^2(1) - 1(2x)}{x^4} = \frac{x^2 - 2x}{x^4}$$

$$\frac{dy}{dx} = \frac{x - 2}{x^3}$$

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

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

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

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

$$y = -4x + 4 + \frac{1}{3}$$

$$y = \frac{-12x + 12 + 1}{3} \quad \frac{-12x + 12 + 1}{3}$$

~~$y =$~~

$y = -4x + 13$

∴ eqn to the tangent $= y = -4x + 13$

$$y - m_{normal} = \frac{-1}{\frac{x-2}{x^3}} = \frac{x^3}{x-2} \times \frac{1}{-1} = \frac{x^3}{-x+2}$$

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

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

$$y - \frac{1}{3} = \frac{x^4 - 3x^3}{-x+2}$$

$$y = \frac{-x^4 + 3x^3}{-x+2} + \frac{1}{3}$$

$$y = \frac{3x^4 - 9x^3 + 3}{-3x+6} + \frac{-x+2}{-3x+6}$$

$$y = \frac{3x^4 - 9x^3 + x + 5}{-3x+6}$$

eqn to the normal $= y = \frac{3x^4 - 9x^3 + x + 5}{-3x+6}$