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Dept: MBBS, Matric NO: 19/mhs01/329

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i) $y = 2x^2$ at the point $(1, 2)$: $x_1 = 1$,

$y_1 = 2$

$y = 2x^2$

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

when $x = 1$

$m = 4(1) = 4$

$m = 4$

a) for the equation of the tangent,

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

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

$y - 2 = 4x - 4$

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

$4x - y - 2 = 0$

$\therefore -y + 4x - 2 = 0$ (eqn of tangent)

b) For the eqn of normal

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

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

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

$1/4x + y - 2 - 1/4 = 0$

$1/4x + y - 9/4 = 0$

Multiply through by 4

$x + 4y - 9 = 0$

$\therefore 4y + x - 9 = 0$ (eqn of the normal)

$y = 3x^2 - 2x$ at the point $(2, 8)$ $\therefore$

$x = 2, \quad y_1 = 8$

$y = 3x^2 - 2x$

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

when $x = 2$

$m = 6(2) - 2$

$m = 12 - 2$

$m = 10$

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a) For the equation of the tangent,

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

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

$y - 8 = 10x - 20$

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

$10x - y - 12 = 0$

$\therefore -y + 10x - 12 = 0$ (eqn of tangent)

b) For the additional of normal,

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

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

$y - 8) = -1/10x + 1/5$

$1/10x + y - 4 1/5 = 0$

Multiply through by 10

$x + 10y - 82 = 0$

$\therefore 10y + x - 82 = 0$ (eqn of the normal)

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

$y = 1/2x^3; \quad x = -1, \quad y = -1/2$

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Gradient $m = \frac{dy}{dx} = 3/2\,x^2$

when $x = -1$

$m = 3/2\,(-1)^2$

$m = \frac{3}{2}$

a) For the equation of the tangent

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

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

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

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

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

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

Multiply through by 2

$3x - 2y + 2 = 0$

$-2y + 3x + 2 = 0$ (eqn of tangent)

the equation of the normal

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

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

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

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

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

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

$4x + 6y + 7 = 0$

$\therefore 6y + 4x + 7 = 0$ (eqn of the normal)

4) $y = 1 + x - x^2$ at the point $(-2, -5) \therefore x = -2, y_1 = -5$

$y = 1 + x - x^2$

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

when $x = -2$

$m = 1 - 2(-2)$

$m = 1 + 4$

$m = 5$

a) For the eqn of the tangent,

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

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

$y + 5 = 5x + 10$

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

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∴ $5y + 5x + 5 = 0$ (eqn of tangent)

b) for the eqn of the normal

$(y - y_1) = \frac{-1}{m}(x - x_1)$

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

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

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

$1/5x + y + 27/5 = 0$

multiply through by 5

$x + 5y + 27 = 0$

$5y + x + 27 = 0$ (eqn of normal)

5) $y = 4/x$ at the point $(3, 1/3)$:

$x_1 = 3, \ y_1 = 1/3$

$y = 1/x = x^{-1}$

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

when $x = 3$

$m = (-3)^{-2}$

a:) For the equation of tangent,

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

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

$y - 1/3 = -1/9x + 1/3$

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$1/9x + y - 2/3 = 0$

Multiply through by 3

$27x - 3y - 80 = 0$

$\therefore -3y + 27x - 80 = 0$ (eqn of normal)

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