Omoragbon Oarkure Favour
19/MHS01/344
MBBS

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

Solution

$dy/dx = 4x$

$\left.\frac{dy}{dx}\right|_{x=1} = 4(1) = 4$

so $m = 4$

$x_1 = 1$ and $y_1 = 2$

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

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

$y - 4x + 2 = 0$

∴ The equation of the tangent is $y - 4x + 2 = 0$

For the gradient of the normal

$m_1 m_2 = -1$

$4 m_2 = -1$

$m_2 = -1/4$

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

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

$4y - 8 = -x + 1$

$4y + x - 9 = 0$

∴ The equation of the normal is $4y + x - 9 = 0$

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

Solution

$dy/dx = 6x - 2$

$dy = 6(2) - 2 = 10$

$dx \mid x = 2$

So $m = \underline{10}$

$x_1 = 2$ and $y_1 = 8$

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

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

$y - 8 = 10x - 20$

$y - 10x + 10$

∴ The equation of line of tangent is $\underline{y - 10x + 10 = 0}$

For the equation of line of normal

$m_1 m_2 = -1$

$10 m_2 = -1$

$m_2 = -1/10$

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

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

$10y - 80 = -x + 2$

$10y + x - 82 = 0$

∴ The equation of line of normal is $\underline{10y + x - 82 = 0}$

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

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

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

$m = 3/2$

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

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

$2y + 1 = 3x + 3$

$2y - 3x - 2 = 0$

∴ Equation of line at tangent $= 2y - 3x - 2 = 0$

$m_1 m_2 = -1$

$3/2\, m_2 = -1$

$m_2 = -2/3$

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

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

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

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

$6y + 4x + 7 = 0$

∴ Equation of line at normal $= 6y + 4x + 7 = 0$

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

$dy/dx = -2x + 1$

$dy/dx \mid x = -2 \quad = -2(-2) + 1 \quad = 5$

$m = 5$

$y_1 = -5$ and $x_1 = -2$

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

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

$y + 5 = 5x + 10$

$y + 5x - 5 = 0$

∴ The equation of the line at tangent is $y + 5x - 5 = 0$

$m_1 m_2 = -1$

$5 m_2 = -1$

$m_2 = -1/5$

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

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

$5y + 25 = -x - 2$

$5y + x + 27 = 0$

∴ The equation of the line at normal is $5y + x + 27 = 0$

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

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

$\frac{dy}{dx}|_{x=3} = -(3)^{-2} = -1/9$

$m = -1/9$

$y_1 = 1/3$ and $x_1 = 3$

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

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

$9y - 3 = -x + 3$

$9y + x - 6 = 0$

∴ The equation of tangent = $9y + x - 6 = 0$

$m_1 m_2 = -1$

$-1/9 m_2 = -1$

$m_2 = 9$

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

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

$y - 1/3 = 9x - 27$

$3y - 1 = 27x - 81$

$3y - 27x + 80 = 0$

∴ The equation of the normal = $3y - 27x + 80 = 0$