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MAT 104 Assignment S/N - 027

For the curves in problem 1 to 5, at the points given find;

a) the equation of the tangent

b) the equation of the normal

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

$x = 1$, $y = 2(1)^2 = 2$

$m = dy/dx = 4x = 4$

a) Equation of tangent, $y - y_1 = m(x - x_1)$

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

$y - 2 = 4x - 4$

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

$\therefore$ $y - 4x + 2 = 0$; the equation of the tangent

b) Equation of the normal, $y - y_1 = -1/m(x - x_1)$

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

$-4y + 8 = x - 1$

$-4y - x + 9 = 0$

$4y + x - 9 = 0$; the equation of the normal.

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

$m = dy/dx = 6x - 2$

when $x = 2$, $m = 10$

a) Equation of tangent; $y - y_1 = m(x - x_1)$

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

$y - 8 = 10x - 20$

$y - 10x + 12 = 0$; the equation of the tangent

b) Equation of the normal, $y - y_1 = -1/m(x - x_1)$

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

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

$-10y - x + 82 = 0$

$10y + x - 82 = 0$; equation of the normal

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

$m = dy/dx$

Using quotient rule, $\dfrac{V\,du/dx - U\,dv/dx}{V^2}$

$dy/dx = 3/2\, x^2$

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

a) Equation of a tangent: $(y - y_1) = m(x - x_1)$

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

$2y + 1 = 3x + 3$

$2y - 3x - 2 = 0$; the equation of the tangent

b) Equation of normal: $y - y_1 = -1/m\,(x - x_1)$

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

Multiply through by 6: $6y + 3 = -4(x + 1)$

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

$6y + 4x + 7 = 0$; the equation of the normal

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

$m = dy/dx = 1 - 2x$

when $x = -2$, $m = 1 - 2(-2) = 5$

a) Equation of a tangent: $(y - y_1) = m(x - x_1)$

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

$y + 5 = 5x + 10$

$y - 5x - 5 = 0$; the equation of the tangent

b). Equation of normal: $y - y_1 = 1/m\,(x - x_1)$

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

$-5y - 25 = x + 2$

$-5y - x - 27 = 0$

$\therefore 5y + x + 30 = 0$

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

$m = dy/dx = x^{-2} = -1/x^2$

when $x = 3$, $m = -1/9$

a) Equation of a tangent : $y - y_1 = m(x - x_1)$

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

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

$9y - 3 = x + 3$

$9y + x - 6 = 0$; the equation of a tangent

b). Equation of a normal : $y - y_1 = -1/m (x - x_1)$

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

multiply all through by 3;

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

$3y - 1 = 27x - 81$

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