Review Exercise Set 5

Exercise 1: Find the derivative of the given function.

$f(x) = 10x^3 - 9x^2 + 6x - 12$

Exercise 2: Find the derivative of the given function.

$f(x) = 10x^{-3/2} + 3x^{-1/2} - 6x + 5$

Exercise 3: Find the derivative of the given function.

$$f(x) = \frac{7x^5 - 3x^4 - x^3 + 4x}{x^2}$$

Exercise 4: Find the slope and equation of the tangent line of the given function at the indicated value of x.

$f(x) = -2x^5 - 6x^3 + 3x^2$; $x = 1$

Exercise 5: Find all the values of x where the tangent line is horizontal for the given function.

$f(x) = 2x^3 + 9x^2 - 60x + 4$

Review Exercise Set 5 Answer Key

Exercise 1: Find the derivative of the given function.

$f(x) = 10x^3 - 9x^2 + 6x - 12$

$f'(x) = 10(3x^{3-1}) - 9(2x^{2-1}) + 6(1x^{1-1}) - 0$
$f'(x) = 10(3x^2) - 9(2x^1) + 6(1x^0)$
$f'(x) = 30x^2 - 18x + 6$

Exercise 2: Find the derivative of the given function.

$f(x) = 10x^{-3/2} + 3x^{-1/2} - 6x + 5$

$f'(x) = 10(-\frac{3}{2}\ x^{-3/2\ -\ 1}) + 3(-\frac{1}{2}\ x^{-1/2\ -\ 1}) - 6(1x^{1-1}) + 0$
$f'(x) = 10(-\frac{3}{2}\ x^{-5/2}) + 3(-\frac{1}{2}\ x^{-3/2}) - 6(1x^0)$
$f'(x) = -15x^{-5/2} - \frac{3}{2}\ x^{-3/2} - 6$

Exercise 3: Find the derivative of the given function.

$$f(x) = \frac{7x^5 - 3x^4 - x^3 + 4x}{x^2}$$

First divide each term in the numerator by the denominator to eliminate the fraction

$f(x) = \frac{7x^5}{x^2} - \frac{3x^4}{x^2} - \frac{x^3}{x^2} + \frac{4x}{x^2}$
$f(x) = 7x^{5-2} - 3x^{4-2} - x^{3-2} + 4x^{1-2}$
$f(x) = 7x^3 - 3x^2 - x^1 + 4x^{-1}$

Now find the derivative

$f'(x) = 7(3x^{3-1}) - 3(2x^{2-1}) - (1x^{1-1}) + 4(-1x^{-1-1})$
$f'(x) = 7(3x^2) - 3(2x^1) - (1x^0) + 4(-1x^{-2})$
$f'(x) = 21x^2 - 6x - 1 - 4x^{-2}$

Exercise 4: Find the slope and equation of the tangent line of the given function at the indicated value of x.

$f(x) = -2x^5 - 6x^3 + 3x^2$; $x = 1$

Find the derivative

$f'(x) = -2(5x^{5-1}) - 6(3x^{3-1}) + 3(2x^{2-1})$
$f'(x) = -2(5x^4) - 6(3x^2) + 3(2x^1)$
$f'(x) = -10x^4 - 18x^2 + 6x$

Find $f'(1)$

$f'(1) = -10(1)^4 - 18(1)^2 + 6(1)$
$f'(1) = -10(1) - 18(1) + 6(1)$
$f'(1) = -10 - 18 + 6$
$f'(1) = -22$

The slope of the tangent line at $x = 1$ is -22.

Find $f(1)$

$f(1) = -2(1)^5 - 6(1)^3 + 3(1)^2$
$f(1) = -2(1) - 6(1) + 3(1)$
$f(1) = -2 - 6 + 3$
$f(1) = -5$

(1, -5) is a point on the tangent line

Find the equation of the tangent line using the point-slope equation of a line

$y - y_1 = m(x - x_1)$; where $m = -22$ and $(x_1, y_1) = (1, -5)$

$y - (-5) = (-22)(x - 1)$
$y + 5 = -22x + 22$
$y = -22x + 17$

Exercise 5: Find all the values of x where the tangent line is horizontal for the given function.

$f(x) = 2x^3 + 9x^2 - 60x + 4$

Find the derivative

$f'(x) = 2(3x^{3-1}) + 9(2x^{2-1}) - 60(1x^{1-1}) + 0$
$f'(x) = 2(3x^2) + 9(2x^1) - 60(1x^0)$
$f'(x) = 6x^2 + 18x - 60$

Exercise 5 (Continued):

Set the derivative equal to zero and solve for x

$0 = 6x^2 + 18x - 60$
$0 = 6(x^2 + 3x - 10)$
$0 = 6(x + 5)(x - 2)$
$x + 5 = 0$ or $x - 2 = 0$
$x = -5$ or $x = 2$

The tangent line would be horizontal (have a zero slope) at $x = -5$ and at $x = 2$.