MCV4U Homework

Prerequisites and Review

Section A: Short Questions

1. Solve each equation.
    a. $2y^2 + y - 3 = 0$
    b. $x^3 + 6x^2 + 3x - 10 = 0$

2. State the domain and range of each function. You may use set notation or interval notation based on your preference.
    a. $y = 2x + 1$
    b. $f(x) = x^2 - 9$
    c. $g(x) = \frac{5}{x+1}$

3. Determine the derivative of each function.
    a. $f(x) = (3x^2 - 6x)^2$
    b. $y = \frac{x^2-9}{x^2+1}$

4. Solve each inequality. State any restrictions on the variable.
    a. $x^2(x - 4) > 0$
    b. $(x + 2)(x - 1) < 0$

Section B: Problem-solving Questions

5. Determine the domain of this function $f(x) = \frac{x^2+3x-4}{x^2-x-6}$. Use either set notation or interval notation, whichever you prefer.

6. A function exists such that $f(x) = 2x^3 - 5x + 1$. Determine the equation of the tangent line to the graph of f at the point where $f'(x) = 0$.

7. A function exists such that $g(x) = \frac{4x-1}{x+3}$. Using first derivative, find all values of x for which the tangent to the graph of f is horizontal.

Answer Key

1. a) $y = -\frac{3}{2},\ 1$

   b) Find a factor for the function → $f(1) = 0$

   $(x - 1)$ is a factor of $f(x)$.

   Use long division to divide $f(x)$ with $(x - 1)$

   Use a cross method to find the factor of the quadratic function.

   $\therefore x = -5,\ -2,\ 1$

2. a) Domain: $(-\infty, \infty)$, Range: $(-\infty, \infty)$

   b) Domain: $(-\infty, \infty)$, Range: $[9, \infty)$

   c) Vertical asymptote: $x = -1$

   Horizontal asymptote: $y = 0$

   Domain: $(-\infty, -1) \cup (-1, \infty)$, Range: $(-\infty, 0) \cup (0, \infty)$

3. a) Using chain rule, $f'(x) = (12x - 12)(3x^2 - 6x)$

   b) Using quotient rule, $f'(x) = \frac{20x}{(x^2+1)^2}$

4. a) $x > 4$

   b) $x < -2$ and $x > 1$

5. Vertical asymptote: $x = -2, 3$

   Domain: $(-\infty, -2) \cup (-2, 3) \cup (3, \infty)$

6. $f'(x) = 6x^2 - 5$

   When $f'(x) = 0$, $x = \pm\sqrt{\frac{5}{6}}$

   $f(\pm\sqrt{\frac{5}{6}}) = \pm\frac{5\sqrt{30}}{18} + 1$

   $\therefore y = 1 \pm \frac{5\sqrt{30}}{18}$

7. $g'(x) = \frac{13}{(x+3)^2}$

When $g'(x) = 0$, $x = DNE$