MCV4U Diagnostic Review from Previous Math Courses

Show your work (you may use separate paper if you need) when you answer the following questions:

1. Determine the slope of the line passing through the following pairs of points:
   a) $(3,7)$ and $(5, -9)$
   b) $(\frac{1}{2}, 3)$ and $(1,4)$

2. Determine the equations of the following lines:
   a) slope: 3, $y$ - intercept: $-5$
   b) slope: 6, through $(2,18)$
   c) through $(3,5)$ and $(6,-4)$
   d) horizontal, through $(4,6)$

3. Evaluate $f(3)$
   a) $f(x) = -x^2 + 5$
   b) $f(x) = (3x - 1)(2x + 4)$

4. Expand and simplify:
   a) $(x - 5)(x + 3) + (2x - 1)(x + 2)$
   b) $(a + 5)^3$
5. Factor the following expressions:
   a) \(x^2 - 2x - 8\)
   b) \(2x^2 - 5x - 3\)
   c) \(x^3 - 2x^2 - 3x\)
   d) \(x^3 - 2x^2 - 5x + 6\)

6. What is the domain of each of the following functions?
   a) \(f(x) = \sqrt{x - 3}\)
   b) \(g(x) = \frac{x^2 + 3}{x - 4}\)
   c) \(h(x) = \frac{7x}{x^2 - 2x - 8}\)
   d) \(j(x) = x^3 + 2x^2\)

7. Find the average rate of change over the interval \(0 \leq x \leq 3\) for the following functions:
   a) \(f(x) = 3x^3 - x^2 + 5\)
   b) \(g(x) = 2^x\)
8. Estimate the instantaneous rate of change when \( x = 5 \) for the following functions:
   a) \( f(x) = 3x^3 - x^2 + 5 \)  
   b) \( g(x) = 2^x \)

9. Simplify the following expressions by using exponent laws:
   a) \( a^7 \times a^2 \)  
   b) \( \frac{5b^5 \times 10b^3}{15b^4} \)  
   c) \( (-3c)^5 (-2c)^2 \)  
   d) \( (d^3 x^7)^2 (d^{-2} x^{-4}) \)

10. For \( f(x) = 4x^2 + 3 \)
    a) Determine the expression for the difference quotient \( \frac{f(a+h)-f(a)}{h} \) when \( a = 2 \)
    b) What can that expression be used for?
    c) Evaluate the expression from part (a) when \( h = 0.01 \).
    d) What does this value represent?