1) Let \( g(x) \) be the function whose graph is the graph of \( f(x) = (x + 1)^3 \) reflected across the \( y \)-axis, shifted down 2 units, moved 3 units to the left, and finally compressed vertically by a factor of 2. What is the \( y \)-intercept of \( g \)?

2) Let \( f(x) \) be an odd function with \((2,4)\) on its graph and let \( g(x) \) be an even function with \((-2,5)\) on its graph.
   a) Find \( (f + g)(2) \)
   b) Find \( \left( \frac{f}{g} \right)(-2) \)
   c) If \( f(x) \) is one-to-one function for what values of \( x \) does \( f(-x) = f(x) \)?
   d) If \( f(x) \) is one-to-one function and \( h(x) = 2\sqrt{x - 1} \), what is \( (f^{-1} \circ h \circ g)(2) \)?

3) Consider the function \( f(x) = x^2 - 2x \).
   a) Find the average rate of change from 2 to \( x \) and simplify.
   b) For what values of \( x \) is the average rate of change equal to 5?

4) Given \( f(x) = 3x^2 - 10x - 8 \) and \( g(x) = \frac{\sqrt{x}}{2} \), find \( g(f(x)) \) and its domain.

5) Given \( f(x) = -\frac{3}{8x} \) and \( g(x) = -\frac{9}{64-16x^2} \), find the composite function \( (f \circ g)(x) \) and its domain.

6) Give two functions such that their composition would result in the function:
   \[ h(x) = \frac{5\sqrt{2x - 1}}{8 - 3\sqrt{2x - 1}} \]

7) The function \( f(x) = -2x^2 + 12x - 19 \) is not one-to-one but can be made so by restricting its domain to a particular interval. If you are told the point \((-9,1)\) is on the graph of the inverse function find \( f^{-1}(x) \) as well as the interval \( f \) was restricted to, to make it one-to-one.

8) Write the equation of parabola with vertex \((-3,2)\) and going through the point \((1,34)\).

9) What is the vertex of a parabola with intercepts \((-6,0), (2,0), (0,3)\)?

10) Graph the following rational function. Include in your graph the x-intercepts, \( y \)-intercept, the holes, the vertical asymptotes and the horizontal asymptotes.
   \[ g(x) = \frac{2x^3 - 5x^2 - 9x + 18}{x^3 - 2x^2 - 9x + 18} \]
11) What are the zeroes of the following polynomial? What are the multiplicities of each zero. Finally, write the linear factors of the polynomial and graph the polynomial [Use synthetic division and the rational roots theorem].

\[ x^6 - x^5 - 9x^4 + 13x^3 + 8x^2 - 12x \]

12) Suppose the weekly Profit for Gator Gadgets, a popular local novelty store, depends on the number of novelty unit produced each week. Now, suppose that the Profit can be modeled by the function \( P(x) = -3x^2 + 7x + 480 \) where \( x \) is the number of novelties produced in thousands per week. How many novelties should Gator Gadgets produce in order to maximize profit?

13) Evaluate \( f(3) \) if \( f(x) = -6x^6 + 20x^5 - 3x^4 - 21x^2 - 20x - 2 \).

14) What value of \( k \) is necessary to make 2 a zero of the function: \( f(x) = 2x^4 - 3x^3 + 2x^2 - 5x + k \)?

15) If the polynomial \( f(x) \) with only real coefficients has the following zeros (multiplicities shown in parenthesis), what is the smallest degree of \( f(x) \)?

\( x = 0 \ (3), \ x = -2 + 3i \ (4), \ x = 3 + 7i \ (1), \ x = -2 \ (1) \)

16) Perform Long Division on the rational function.

\[ f(x) = \frac{-9x^3 - 2x - 6}{3x^2 - 2x + 5} \]

17) Simplify the complex valued expressions...

a) \( \frac{5}{i^{59}} \)

b) \( (2 + 3i)^2 \)

c) \( -\frac{2i}{2+i} + \frac{i}{3-2i} \)

d) \( \frac{(3 + \sqrt{-4})(4 - \sqrt{-9})}{\sqrt{-5}\sqrt{-20}} \)

18) Solve for \( x \):

\( (x - (3 - 2i))(x - (3 + 2i)) = 4 - 6x \)