MA 109 Assignment 2 - Due July 5, 2016

For all problems on this assignment, give exact answers and show all your work. If you need more room, you may use the backs of the pages, but clearly indicate that you are doing so.

1. Find the domain of each of the following functions. Write your answers in interval notation.
   
   (a) (4 points) \( g(x) = \sqrt{9 - (x + 1)^2}. \)
   
   (b) (4 points) \( h(x) = \frac{(x-1)(x-2)(x-3)}{x(x-2)(x-4)} \).
   
   (c) (6 points) \((j + k)(x), \text{ where } j(x) = \sqrt{-x} \text{ and } k(x) = \frac{2}{x + 1}.\)
   
   (d) (6 points) \((\ell \circ m)(x), \text{ where } \ell(x) = \frac{1}{\sqrt{x}} \text{ and } m(x) = x^3 + 2x^2 + x.\)
2. For each function below, compute the difference quotient. Simplify.
   (a) (4 points) \( f(x) = -10x + 875\pi^2 \).
   
   (b) (4 points) \( g(x) = x^3 \).
   
   (c) (6 points) \( h(x) = \sqrt{x} \).
   
   (d) (6 points) \( j(x) = ax^2 + bx + c \), where \( a \), \( b \), and \( c \) are real numbers.
3. Consider the function $f$ graphed below:

(a) (2 points) What is the domain of $f$?

(b) (2 points) What is the range of $f$?

(c) (2 points) For which $x$ values is $f(x) < 0$?

(d) (2 points) For which $x$ values is $f(x) \geq 2$?
4. Let \( f(x) = \frac{(x-4)^3 + 5}{2} \).

(a) (3 points) Show that \( f \) is one-to-one by showing that \( f(b) = f(a) \) implies \( b = a \).

(b) (3 points) Find the inverse function \( f^{-1}(x) \).

5. (a) (6 points) Let \( g(x) = \frac{ax + b}{cx + d} \), where \( a, b, c \) and \( d \) are real numbers such that \( ad - bc \neq 0 \).

Find the inverse function \( g^{-1}(x) \).

(b) (2 points (bonus)) Why can’t \( ad - bc \) be 0 in part (a)?