Math 4050 **Practice Problem Set #1**

Problem 1.1 Suppose that x is proportional to y and inversely proportional to the square of z. If $y = 10$ and $z = 5$, then $x = 2$. Find x if $y = 4$ and $z = 7$.

Problem 1.2 Let $f(x) = x^2$ and $g(x) = \sqrt{x - 16}$.

- Find $f \circ g$, and find the domain of the composition. Express the domain using interval notation.
- Find $g \circ f$, and find the domain of the composition. Express the domain using interval notation.

Problem 1.3 Let $f(x) = \dfrac{x+1}{x-2}$ and $g(x) = \dfrac{x+4}{x-3}$.

- Find the function fg, and find the domain of this function.
- Find the function f/g, and find the domain of this function.

Problem 1.4 A manufacturer finds that the daily revenue generated by selling x widgets daily is given by the function

$$R(x) = 80x - 0.2x^2,$$

where the daily revenue $R(x)$ is measured in dollars. What is the maximum daily revenue, and how many widgets should be manufactured to obtain this maximum?

Problem 1.5 A function f is given, and the indicated transformations are applied to its graph in the given order. Write and simplify the equation for the final transformed graph.

- $f(x) = x^2$
- Stretch horizontally by a factor of 3
- Shift to the left 2 units
- Reflect across the $x-$axis
- Stretch vertically by a factor of 4
- Shift upward 5 units

Problem 1.6 Find the inverse of the function

$$f(x) = \frac{3x+1}{x-2}.$$

Also, state the domain and the range of f^{-1}.

Problem 1.7 A man stands at a point A on the bank of a straight river which is 2 miles wide. To reach point B, 7 miles downstream from the opposite bank, he first rows his boat to point P on the opposite bank and then walks the remaining distance x to B, as shown in the figure. He can row at a speed of 2 miles per hour and walk at a speed of 5 miles per hour.

Find a function that models the time needed for the trip in terms of the distance x.

Problem 1.8 Determine whether the function

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

is even, odd, or neither.

Problem 1.9 Determine if the function $f(x) = 2x^2 - 6x - 8$ has a maximum value or a minimum value. Then find that value.

Problem 1.10 Find the domain of the function $Q(x) = \dfrac{1}{\sqrt{x^2 - 12}}$.

Problem 1.11 Sketch a function that does *not* have an inverse. (No computations are required for this problem.)

Problem 1.12 Sketch the graph of

$$f(x) = \begin{cases} x^2, & x \leq 1 \\ -2x + 5, & x > 1 \end{cases}$$

Problem 1.13 Find the equation of the quadratic function plotted below. You may write your answer in either the form

$$f(x) = ax^2 + bx + c \qquad \text{or} \qquad f(x) = a(x - h)^2 + k.$$