NAME:

1. [5] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F. Let f and g be functions, and x, y, and z be non-zero real numbers.

   T   F $\frac{2}{x} + \frac{1}{x+1} = \frac{2+1}{x+1} + \frac{1}{x+1} = \frac{4}{x+1}$

   T   F $x^2 - y^2 = (x + y)(x - y)$

   T   F   A graph is a graph of a function if it passes the horizontal line test.

   T   F   The functions $f(x) = 2x - 5$ and $g(x) = \frac{x+5}{2}$ are inverses of each other.

   T   F   The domain of $\frac{\sqrt{2+x}}{3-x}$ is $(-\infty, 3)$ and $(3, \infty)$.
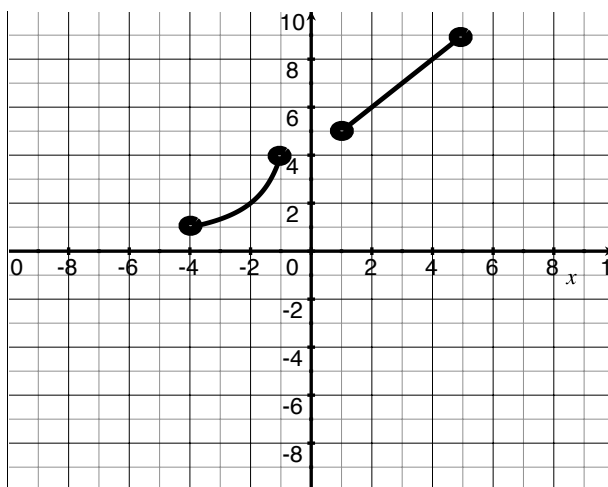
Show your work for the following problems. The correct answer with no supporting work will receive NO credit.

2. The graph on the right is a graph of the function f.

   (a) [1] (WebHW2#6) What is the domain of f?

   (b) [1] (WebHW2#6) What is the range of f?
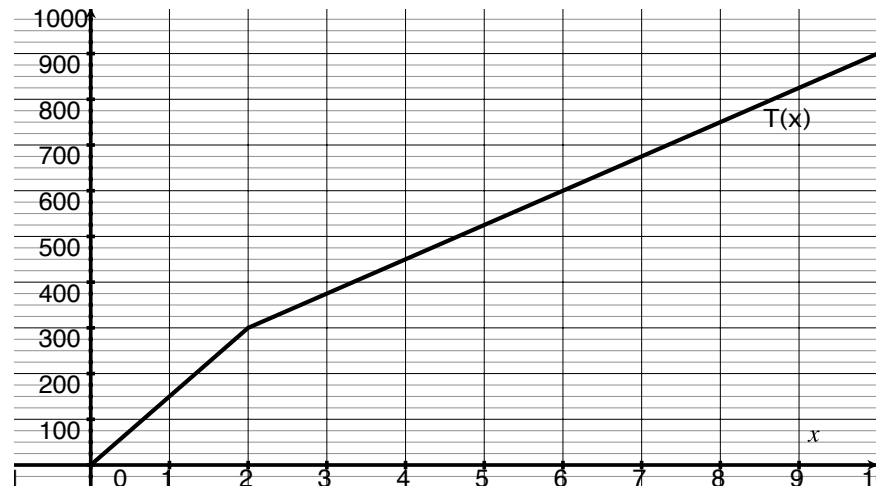
   (c) [2] (§2.8 #69) Sketch the graph of f^{-1}

3. [3] (§1.5 #17) Find all x so that:

$$\frac{1}{x} = \frac{4}{3x} + 1$$

4. The graph on the right is of T, the total cost of staying in a hotel for x nights.

(a) [1] (WebHW2 #6)
    Estimate $T(6)$.

(b) [2] (§2.7 #11)
    Estimate $(T + T)(2)$.

(c) [2] (§2.1 #68) What does the answer in part (a) represent?
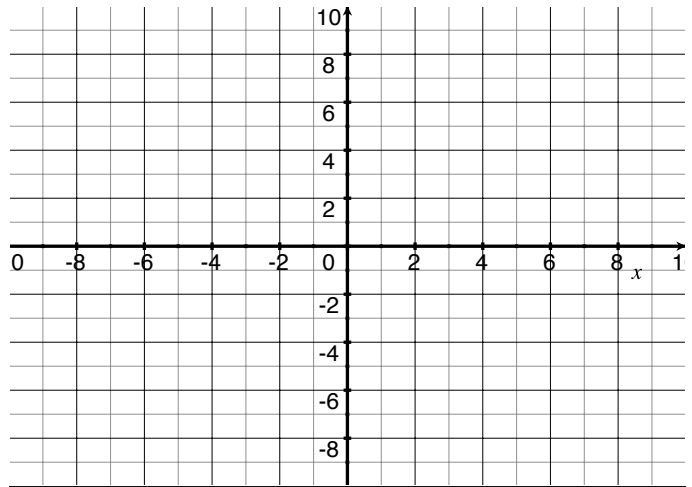
(d) [3] (§2.1 #68) Find a formula for the function T in the indicated form.

$$T(x) = \begin{cases} & \text{if } 0 \le x < 2 \\ & \text{if } 2 < x \end{cases}$$

5. Let $q(x) = x^2 + 4x - 2$.

    (a) [3] (WebHW4 #5) Complete the square to write q in vertex form $(a(x-h)^2 + k)$.

    (b) [2] (§2.4 #25) List the graph transformations that would perform the graph of $f(x) = x^2$ into the graph of q. Be sure to list the transformations in order.

    (c) [2] (WebHW4 #5) Graph q.

    (d) [3] (§2.7 #31) Find (but do *not* simplify) $(q \circ q)(x)$.

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6. [3] (WebHW5 #11 & 14) Perform the indicated addition or division and write the result in the form $a + bi$
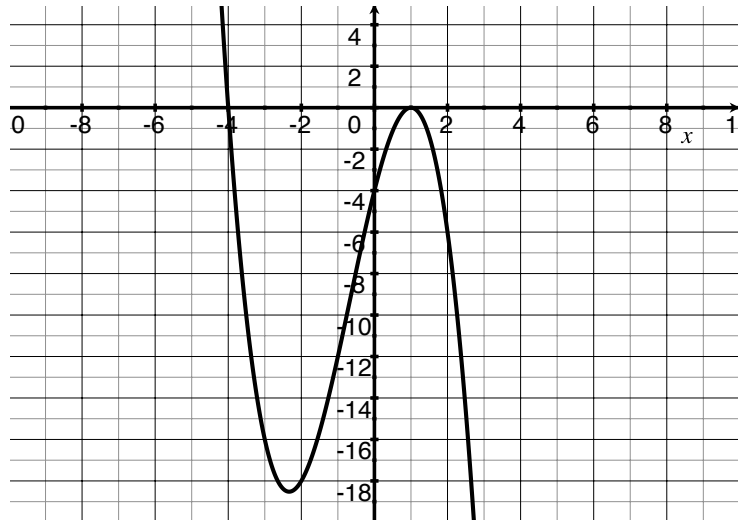
$(-4 + 4i) + (5 - i)$
$$\frac{100 + 75i}{4 - 3i}$$

7. [4] (§1.2 #39) Simplify the given expression:

$$\frac{(x^2y^3)^4(xy^4)^{-3}}{x^2y}$$

8. [3] (WebHW6 #14) Find a degree four polynomial whose graph is shown to the right.

9. [3] (WebHW6 #11) Find the quotient and remainder using long division of

$$\frac{6x^3 + 2x^2 + 26x}{2x^2 + 3}$$

10. [6] (Story Problem Worksheet) Choose *ONE* of the following. Clearly identify which of the two you are answering and what work you want to be considered for credit.

(a) (Lecture) A gutter is to be made by bending up the edge of a 15 inch wide piece of aluminum. What depth should the gutter be to have the maximal possible cross sectional area?

(b) (§2.6 Example 6) A hockey team plays in an arena with a seating capacity of 15,000 spectators. Which the ticket price set at $14, average attendance at recent games has been 9500. A market survey indicates that for each dollar the ticket price is lowered, the average attendance increases by 1000. Find the price that maximizes revenue from ticket sales.