MATH 161 — Precalculus[1]
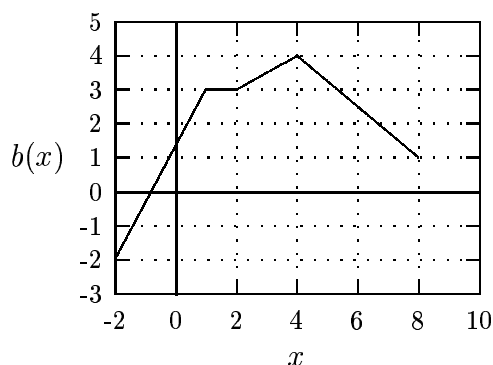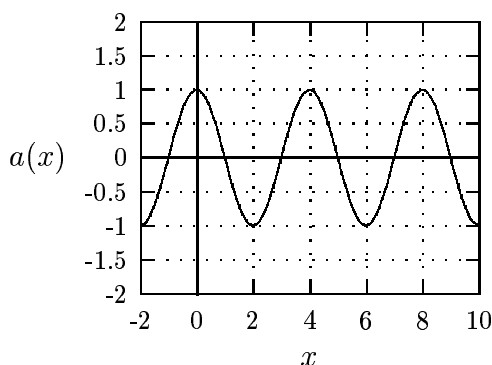# Community College of Philadelphia

Math 161 — Chapter 6 Homework

For Problems 1 and 5 consider the five functions f, g, h, a, and b; three of which are given by the algebraic formulas,

- $f(x) = x^3$

- $g(x) = 2x + 3$

- $h(x) = \sqrt{2x}$

and two of which are illustrated in the graphs below.

1. Using the functions defined above, evaluate the following expressions.

   (a) $(f + g)(2)$

   (b) $(f - a)(0)$

   (c) $(h \cdot b)(1)$

   (d) $(a - b)(-1)$

   (e) $(b + h - a)(8)$

   (f) $(g \div h)(2)$

   (g) $(g \cdot b)(1.5)$

   (h) $(g \cdot b \div f)(-1.5)$

   (i) $(a + f)(6)$

   (j) $(a \div g)(0)$

2. Let $f(x) = x^2 - 3$, $g(x) = 2x - 4$, $h(x) = \frac{x}{2}$. Find:

   (a) $(f + g)(3)$

   (b) $(f - g)(1)$

   (c) $(hg)(5)$

   (d) $(f/h)(-2)$

   (e) $(f + g)(t)$

   (f) $(f - g)(2m)$

   (g) $(hf)(x + 5)$

   (h) $(f + g - h)(8)$

   (i) $(f + 2g)(-1)$

   (j) $(3g - 2f)(1)$

   (k) $(fg)(t)$

   (l) $(h/g)(t - 2)$

3. Let $f = \{(0,1), (1,8), (2,3), (3,0)\}$, $g = \{(1,6), (2,7), (3,8)\}$, $h = \{(0,9), (3,-1), (8,0)\}$. Give each of the following functions as a set of ordered pairs, and give the domain and range of each.

   (a) $f + g$

   (b) f/g

   (c) $f - h$

   (d) fg

4. Evaluate those of the following that are defined, and indicate which are not defined. Refer to the functions in 3.

   (a) $g \circ f(0)$

   (b) $h \circ f(1)$

   (c) $h \circ f(2)$

   (d) $g \circ f(0)$

   (e) $f \circ f(0)$

   (f) $g \circ f \circ h(8)$

5. Using the functions defined above Problem 1, construct the indicated compositions (where defined).

(a) $g \circ f(8)$

(b) $f \circ g(8)$

(c) $g \circ f(x)$

(d) $f \circ g(x)$

(e) $a \circ b(3)$

(f) $f \circ b(-1)$

(g) $a \circ h(18)$

(h) $h \circ g(2.5)$

(i) $h \circ g(-2)$

(j) $a \circ b(-1)$

(k) $a \circ g(0)$

6. Using the functions defined in Exercise 2, construct the indicated compositions, where possible. If not possible, explain what the trouble is.

(a) $g \circ f(1)$

(b) $f \circ g(6)$

(c) $g \circ f(x)$

(d) $f \circ g(x)$

(e) $h \circ f(3)$

(f) $f \circ f(-1)$

(g) $f \circ h(3)$

(h) $h \circ g(13)$

(i) $g \circ h(8)$

(j) $h \circ h \circ h(-1)$

(k) $f \circ g(t)$

(l) $g \circ f(2x)$

(m) $f \circ g(-t)$

(n) $g \circ f(x-1)$

(o) $f \circ g(x+2)$

(p) $h \circ f \circ h(3)$

(q) $f \circ f(-x)$

(r) $f \circ h(3t)$

(s) $h \circ g(\frac{1}{3})$

(t) $g \circ h(0)$

(u) $g \circ g \circ g(x)$

(v) $f \circ g(t)$

7. Write each of the following as a composition of simpler functions. You may use more than 2 simpler functions if this is appropriate. When doing decomposition problems, it is important to define the simpler functions clearly, and to state the order in which they appear.

(a) $h(x) = (2x + 5)^3$

(b) $R(x) = (x - 1)^2 + 13$

(c) $F(x) = \sqrt{5x + 7}$

(d) $G(x) = |(4x - 9)^3 + 41|$

(e) $f(x) = |(4x - 9)^3| + 41$

(f) $H(x) = (3x + 7)^4 + (3x + 7)^3 + (3x + 7)^2$

(g) $L(x) = 10 - \sqrt{7 + |4 - x|}$
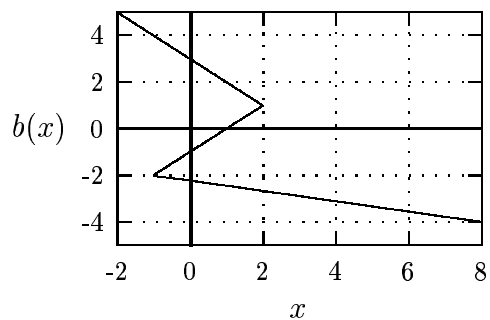
(h) $K(x) = \frac{8}{x^3 - 15}$

8. For each of the graphs below answer the following questions:

-   Is this the graph of a function? (If your answer to this question for a graph is no, no further questions for the graph need to be answered.)

-   Is the function one-to-one?

-   If the function is not one-to-one, give a restricted domain for which the function is one-to-one.
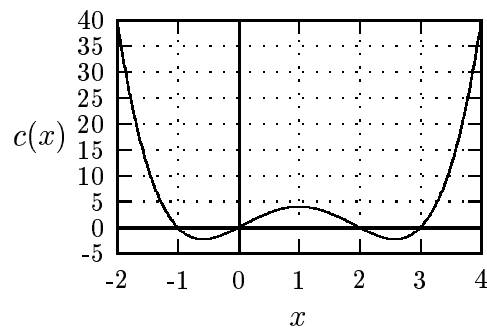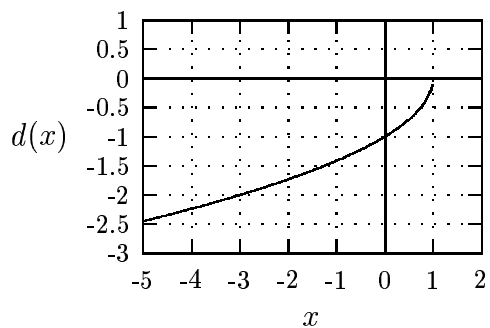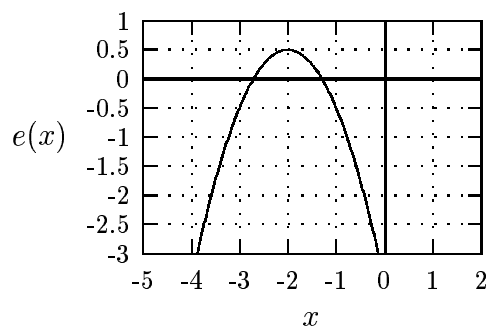
Problem 8, Graph A
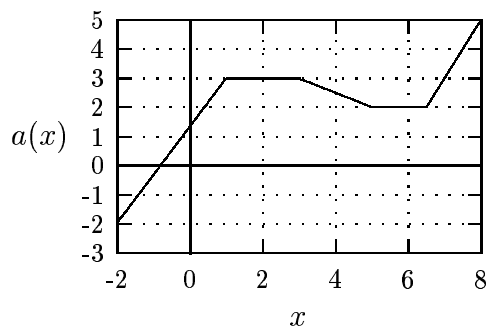
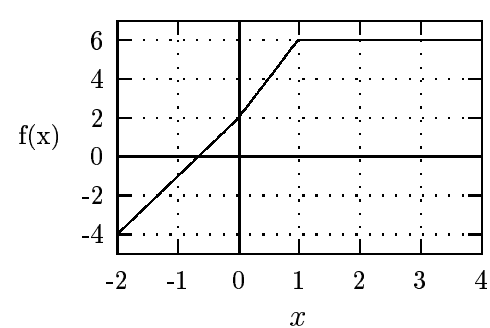Problem 8, Graph B

Problem 8, Graph C

Problem 8, Graph D

Problem 8, Graph E

Problem 8, Graph F

9. For each of the functions in 3 give the inverse function, if it exists.

10. Using the functions in 3, find each of the following that exists:

   (a) $f^{-1}(1)$

   (b) $f^{-1}(8)$

   (c) $g^{-1}(1)$

    (d) $g^{-1}(6)$

    (e) $h^{-1}(0)$

    (f) $h^{-1}(1)$

    (g) $f^{-1}(8)$

11. For each of the following functions, determine whether the function is one-to-one. If so, find its inverse. If it is not one-to-one, give a restricted domain on which it is one-to-one, and find its inverse on that domain.

    (a) $a(x) = 4.5x - 3$

    (b) $b(x) = \sqrt{-2x}$

    (c) $c(x) = |x| - 3$

    (d) $d(x) = 3(x - 2)^2 - 3$
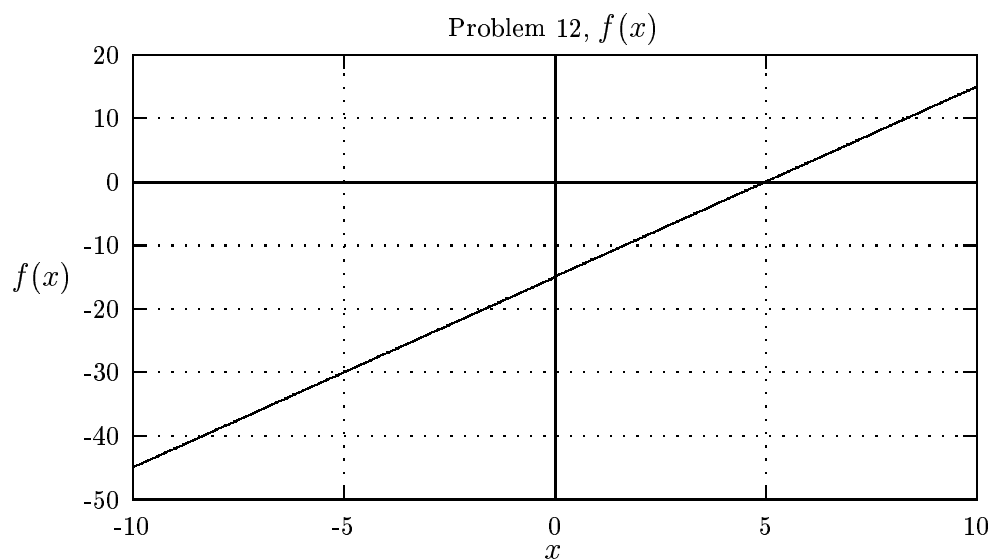
    (e) $e(x) = x$
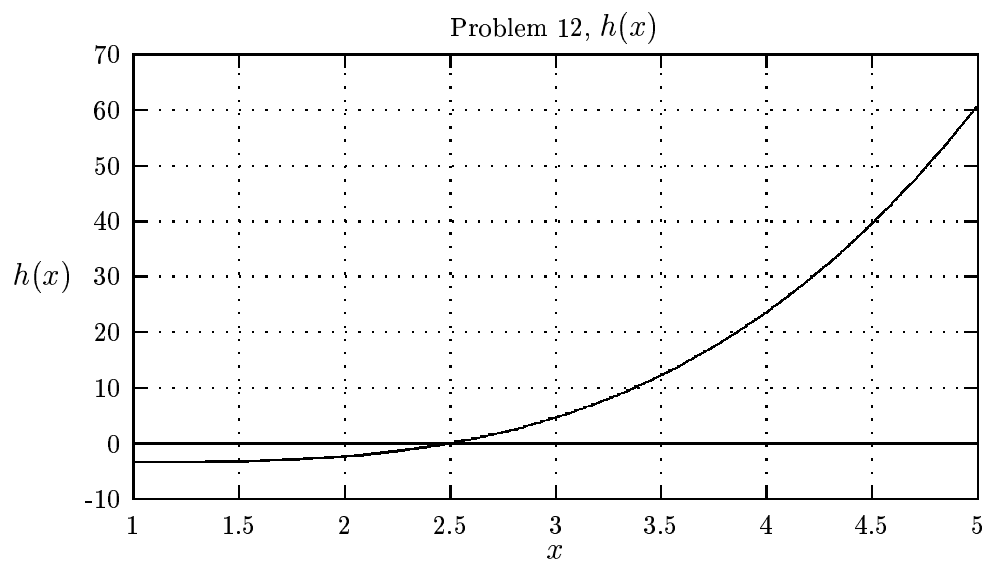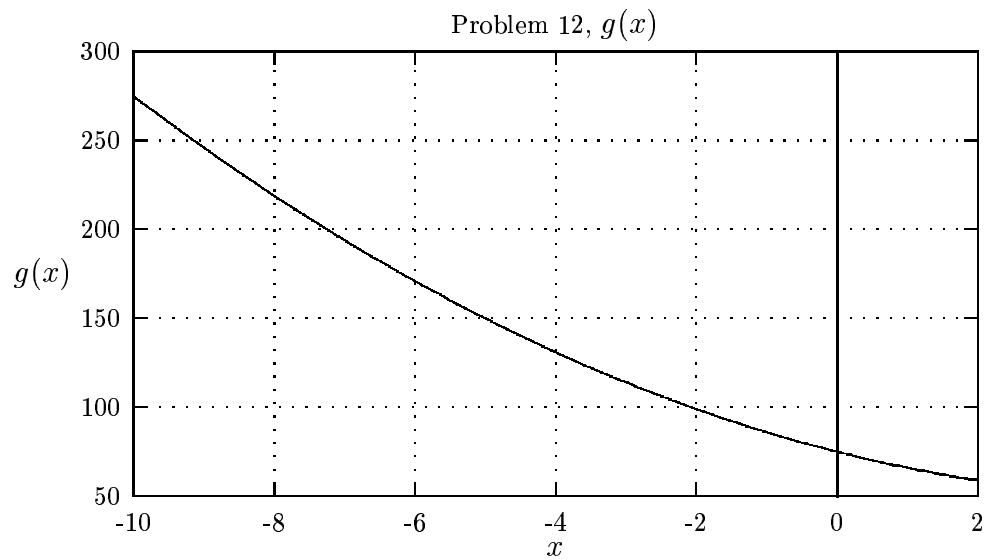
    (f) $f(x) = 8x^3 - 1$

    (g) $g(x) = -x^2$

    (h) $h(x) = 3 + \sqrt{x}$

    (i) $i(x) = (3 - x)^2$

12. The graphs below are illustrations of a pieces of a linear function $f(x)$, a quadratic function $g(x)$, and a cubic function $h(x)$.

Problem 12, $f(x)$

Problem 12, $g(x)$

Problem 12, $h(x)$

Estimate the following quantities from the graphs:

(a) $f^{-1}(0)$

(b) $f^{-1}(-30))$

(c) $f^{-1}(7.5)$

(d) $g^{-1}(100)$

(e) $g^{-1}(250)$

(f) $g^{-1}(75)$

(g) $h^{-1}(0)$

(h) $h^{-1}(40)$

(i) $h^{-1}(5)$

13. Find the inverse of each of the following functions:

(a) $f(x) = 2x - 7$

(b) $g(x) = 2(x - 7)$

(c) $h(x) = x^2 + 1$ (Assume $x > 0$)

(d) $F(x) = -(x - 1)(x + 1)$ (Assume $x < -1$)

(e) $G(x) = x^3 + 4$

(f) $H(x) = 6x$

(g) $Q(x) = |x - 1|$ (Assume $x > 1$)

(h) $R(x) = 2(x - 3)^2$ What assumption about x must you make?

(i) $S(x) = 4|x + \sqrt{2}|$ (Assume $x > -\sqrt{2}$)

(j) $T(x) = 13 - 6|x|$ What assumption about x must you make?

(k) $U(x) = 27 + 54x$

(l) $V(x) = (4x)^2 - 5$ What assumption about x must you make?

(m) $W(x) = 3|x + 1| + 4$ (Assume $x > -1$)