MATH 161 — Precalculus[1]
Community College of Philadelphia

Math 161 — Chapter 2
Homework

1. If $f(x) = .5x + 4.2$ and $g(x) = 4x - 2$, find:

   (a) $f(4)$

   (b) $g(8)$

   (c) $f(3) + g(3)$

   (d) $3f(\pi) - g(\pi)$

   (e) $(f(0) + g(0))^2$

   (f) $f^2(0) + 2f(0)g(0) + g^2(0)$

   (g) Compare your answers in 1d and 1e. What do you observe? How do you explain it?

   (h) Which is larger, $f(5)$ or $g(5)$?

   (i) Which function has the larger slope?

   (j) Which function has the larger y-intercept?

2. Given $f(x) = x^3$, $g(x) = .5(x - 3)$, and $h(x) = -6x + 4$, find:

   (a) $f(7)$

   (b) $g(-1)$

   (c) $h(5)$

   (d) $f(6) + g(6)$

   (e) $f(2) - g(2)$

   (f) $h(2)$

   (g) $g(\pi) + h(\pi)$

   (h) $f(7)/g(7)$

   (i) $f(1)g(1)$

   (j) $(f(5) - h(5))^2$

   (k) $f^2(5) - 2f(5)h(5) + h^2(5)$

3. Sketch the graph of each of the following functions:

   (a)
x	1	2	3	4	5
y	10	9	8	7	6

(b)

x	1	2	3	-1	-2
y	0	3	8	0	3

(c)

$$f(x) = \begin{cases} 2 & \text{if } x < 3 \\ 4 & \text{if } x \geq 3 \end{cases}$$

(d)

$$g(x) = \begin{cases} -x + 1 & \text{if } x < 0 \\ 1 & \text{if } x \geq 0 \end{cases}$$

(e)

$$h(x) = \begin{cases} -.4(3 - 2.5x) & \text{if } x < -2 \\ 2x + .8 & \text{if } x \geq -2 \end{cases}$$

(f)

$$w(x) = \begin{cases} 2(x + 4) & \text{if } x < -2 \\ 4 & \text{if } -2 \leq x < 3 \\ 2x - 2 & \text{if } x \geq 3 \end{cases}$$

4. Let $g(x) = x - 7$. Give

   (a) the y-coordinate of the point on the graph with x-coordinate 5.

   (b) the y-coordinate of the point on the graph with x-coordinate -2.

   (c) the y-coordinate of the point on the graph with x-coordinate 8.

   (d) the y-coordinate of the point on the graph with x-coordinate 23.

   (e) the x-coordinate of the point on the graph with y-coordinate -4.

   (f) the x-coordinate of the point on the graph with y-coordinate -8.

5. Suppose the function g is defined by the following table:

x	-1	0	1	2	3
y	2	-3	4	4	11

   (a) Give the domain of g.

   (b) Give the range of g.

   (c) Give

        i. $g(-1)$

        ii. $g(0)$

        iii. $g(3)$

        iv. $g(2)$

        v. $g(5)$

6. Let the function h be defined by $h = \{(2, -7), (1, 4), (6, 1)\}$.

   (a) Give the domain of h.

   (b) Give the range of h.

   (c) Give

        i. $h(2)$

        ii. $h(1)$

        iii. $h(6)$

7. Suppose the graph below defines the function j.

Graph of function j
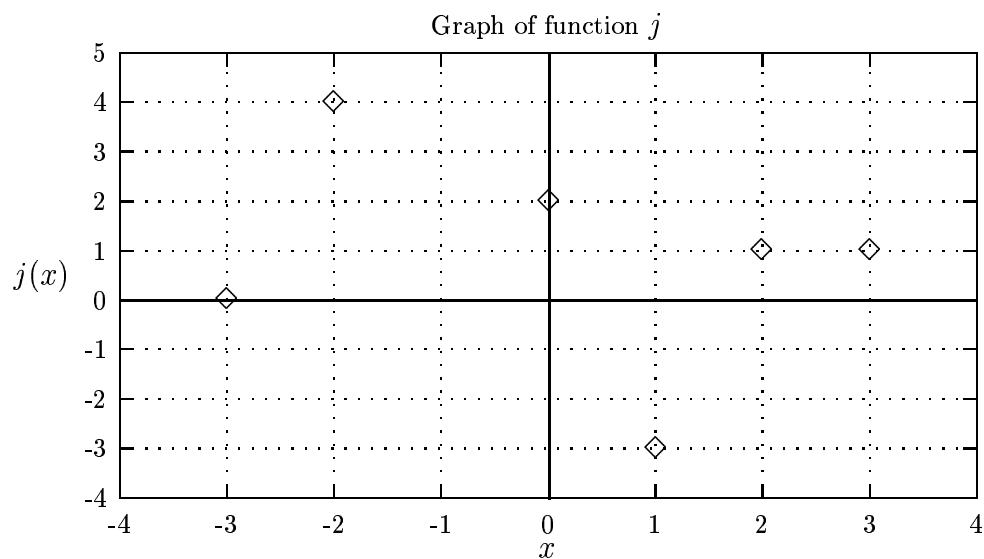
(a) Give the domain of j.

(b) Give the range of j.

(c) Give

    i. $j(-2)$

    ii. $j(-1)$

    iii. $j(0)$

    iv. $j(1)$

    v. $j(2)$

    vi. $j(3)$

8. Draw a coordinate system and plot 5 points with x-coordinate greater than 2 and y-coordinate greater than 3.

9. Draw a coordinate system and shade in the set of all points (x, y) such that $x > 2$ and $y > 3$.

10. Draw a coordinate system and plot 5 points with x-coordinate greater than 0 and y-coordinate less than 0.

11. Draw a coordinate system and shade in the set of all points (x, y) such that $x > 0$ and $y < 0$.

12. Draw a coordinate system and plot 5 points with x-coordinate less than 5 and y-coordinate less than 1.

13. Draw a coordinate system and shade in the set of all points (x, y) such that $x < 5$ and $y < 1$.

14. Consider the points $P = (7, 5)$, $Q = (2, -1)$, $R = (-4, 3)$, and $S = (1, 8)$.

(a) Plot the points.

(b) List these points in order from the one with the largest y-coordinate to the one with the smallest y-coordinate.

(c) List these points in order from the one with the largest x-coordinate to the one with the smallest x-coordinate.

(d) List and plot 3 points (any points you choose) with x-coordinate greater than that of S.

(e) Sketch the set of all points in the plane that have x-coordinate greater than that of S.

(f) Write an inequality that describes the set of all points in the plane that have an x-coordinate greater than that of S.

(g) Sketch the set of all points in the plane that have x-coordinate greater than that of R.

(h) Write an inequality that describes the set of all points in the plane that have an x-coordinate greater than that of S.

(i) List and plot 3 points (any points you choose) with x-coordinate greater than that of R and less than that of Q.

(j) Sketch the set of all points in the plane that have x-coordinate greater than that of R and less than that of Q.

(k) Write an inequality that describes the set of all points in the plane that have an x-coordinate greater than that of R and less than that of Q.

(l) List and plot 3 points (any points you choose) with y-coordinate greater than that of R and less than that of S.

(m) Sketch the set of all points in the plane that have y-coordinate greater than that of R and less than that of S.

(n) Write an inequality that describes the set of all points in the plane that have an y-coordinate greater than that of R and less than that of S.

15. For each of the following correspondences, determine whether the correspondence defines a function. If the correspondence does not define a function give a specific reason why it doesn't.
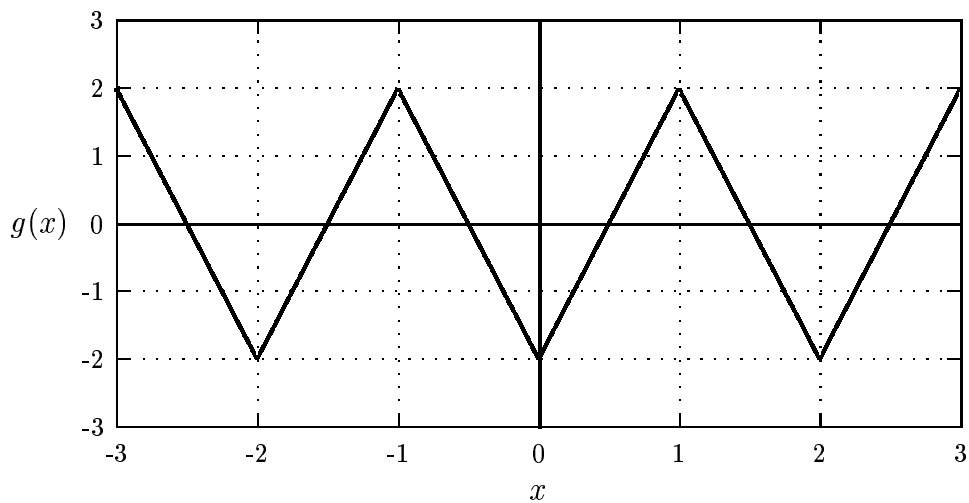
(a)

Problem 15a
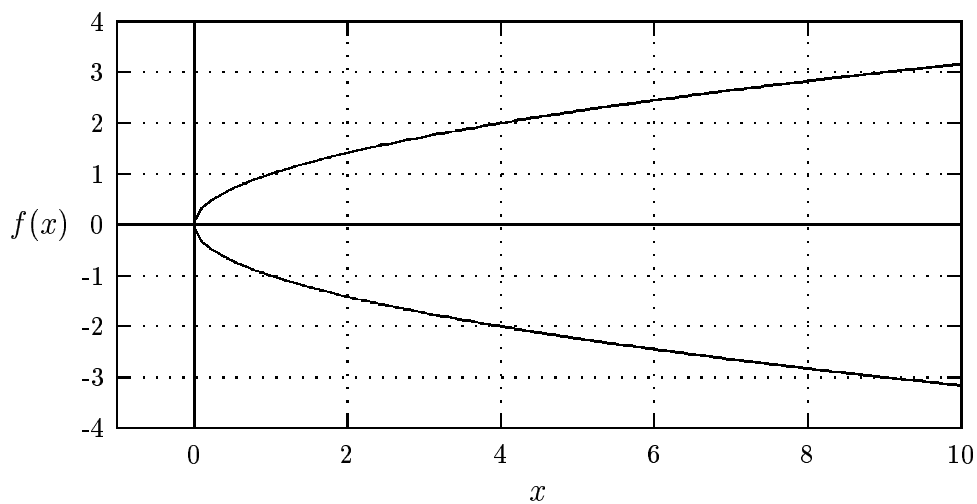
(b)

Problem 15b

(c)

$$f(x) = \begin{cases} -x & \text{for } x < -1 \\ 7 & \text{for } x \geq -2 \end{cases}$$

(d)

$$g(x) = \begin{cases} 2 & \text{for } x > 4 \\ 3 & \text{for } x < 1 \end{cases}$$

(e)

$$h(x) = \begin{cases} x^2 & \text{for } x > 6 \\ 7 & \text{for } x < 2 \end{cases}$$

(f)

$$j(x) = \begin{cases} 4x + 4 & \text{for } x \leq 4 \\ 3 & \text{for } x \geq 4 \end{cases}$$

(g)

x	1	2	3	4	5
y	2	3	4	5	5

(h)

x	1	2	3	4	4
y	2	3	4	5	6

(i)

x	1	2	3	-1	-2
y	1	8	9	1	8

(j)

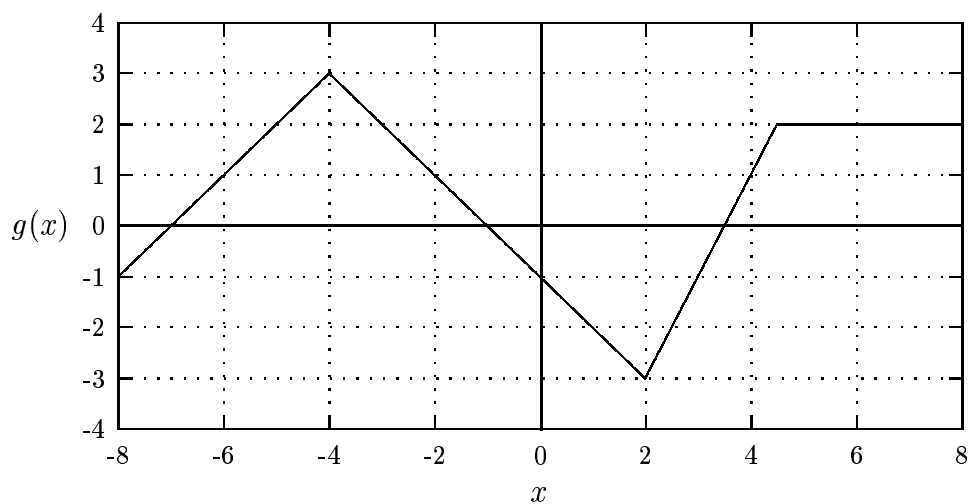| x	1	2	3	2	5
y	7	-8	1	2	1

16. The graph of a function $g(x)$ is illustrated below. Answer the following questions by examining the graph.

Problem 16

(a) Give $g(2)$

(b) Give $g(0)$

(c) Give $g(-1)$

(d) Describe, using interval notation, the complete set of x values for which $g(x) < -1$

(e) Describe using interval notation the complete set of x values for which $g(x) > 2$ is greater than 2.

(f) Describe using interval notation the complete set of x values for which $g(x) > 1$.

(g) Give all intervals over which the function g is increasing.

(h) Give all intervals over which the function g is decreasing.

17. The graphs of two functions, $a(x)$ and $b(x)$ are illustrated below. Answer the following questions by examining the graphs.

Problem 17
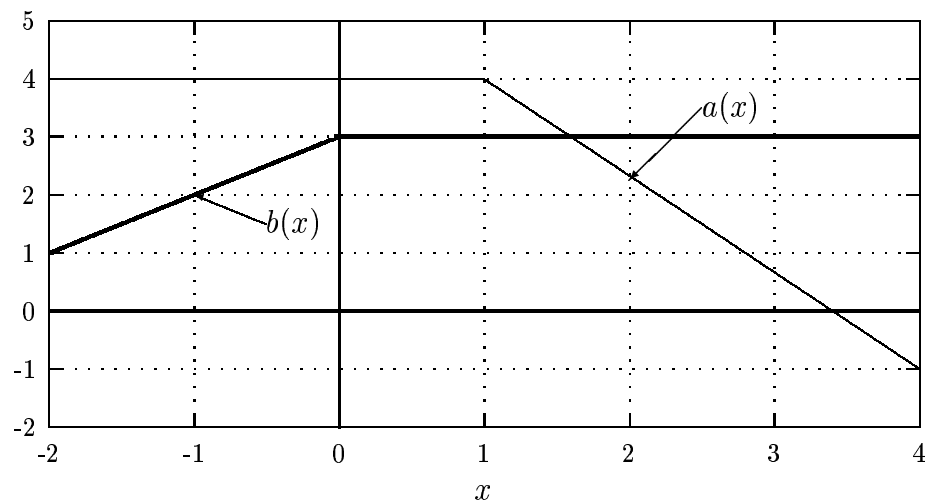
(a) Give $a(2)$

(b) Give $b(2)$

(c) Give $a(-2)$

(d) Give $b(-2)$

(e) Give $a(0) + b(0)$

(f) Give $b(-1) - 4a(-1)$

(g) Give an interval over which the value of the function a is always greater than the value of the function b.

(h) Give an interval over which the slope of the function a is always less than the slope of the function b.

(i) Give an interval over which the product of the functions a and b is always positive.

18. Find the slope of each function in 18a through 18d below, and order them from smallest to largest. Indicate if any of the functions represent parallel lines.

(a) $f(x) = 33.5 - 4x$

(b) $g(x) = 0.8(2x - \sqrt{3})$

(c) $h(x) = 33.5$

(d) $i(x) = (x - 2)/\pi$

19. Consider the function $f(x) = -4x + 2.5$.

    (a) Calculate the average rate of change of the function over the following intervals:

        i. $[2, 3]$
        ii. $[-4, -2]$
        iii. $[-1, 2]$

    (b) What is the slope of the function f?

20. Consider the function $g(x) = -\sqrt{2}x + 6\pi$.

    (a) Calculate the average rate of change of the function over the following intervals:

        i. $[1, 5]$
        ii. $[-4, -2]$
        iii. $[-1, 3]$

    (b) What is the slope of the function g?

21. Consider the function $p(t) = -.23(x + \sqrt{9})$.

    (a) Calculate the average rate of change of the function over the following intervals:

        i. $[1, 2]$
        ii. $[-14.2, -6.8]$
        iii. $[-1.5, 3]$

    (b) What is the slope of the function p?

22. Consider the function

$$h(x) = \begin{cases} 2.5x + 1 & \text{for } x < 0 \\ 1 & \text{for } x \geq 0 \end{cases}$$
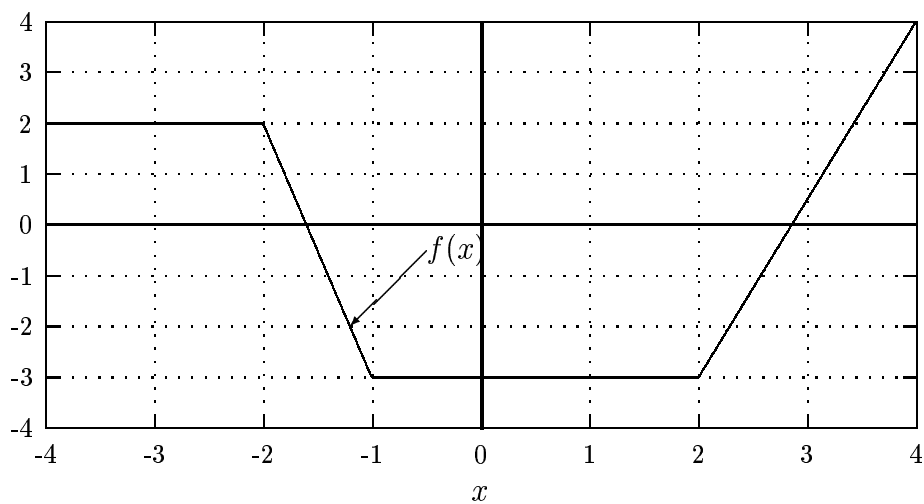
    (a) Sketch the graph of the function $h(x)$.

    (b) Calculate the average rate of change of the function over the following intervals:

      i. $[1, 5]$

     ii. $[5, 10]$

    iii. $[-4, -2]$

    iv. $[-5, -4]$

     v. $[-1, 3]$

23. The following graph illustrates a function $f(x)$. Calculate the average rate of change of the function f with respect to x over the indicated intervals:

Problem 23

    (a) $[-1, 0]$.

    (b) $[0, 1]$.

    (c) $[1, 2]$.

    (d) $[0, 2]$.

24. Consider the function

$$p(t) = \begin{cases} 2 - \frac{t}{4} & \text{for } t < -1 \\ \frac{3t}{4} + 3 & \text{for } t \geq -1 \end{cases}$$

(a) Sketch the graph of the function $p(t)$.

(b) Calculate the average rate of change of the function p with respect to t over the following intervals:

    i. $[1, 2]$

    ii. $[4, 6]$

    iii. $[-4, -3]$

    iv. $[-4, -2]$

    v. $[-4, -1]$

    vi. $[-4, 0]$

    vii. $[-4, 1]$

25. For each part below, write the formula for a piecewise-defined function satisfying the given conditions. The domain of the function should be all real numbers.

(a) The graph consists of two horizontal pieces, and the points $(0, 1)$ and $(2, -3)$ lie on the graph.

(b) The graph consists of two linear pieces meeting at $(4, 2)$.

(c) The graph consists of two linear pieces, one with a positive slope and one with a negative slope, and the pieces meet at $(1, 3)$.

(d) The graph consists of two linear pieces, is continuous (that is, the pieces meet), and the function have negative outputs for negative inputs, and positive outputs for positive inputs.

(e) The graph consists of three linear pieces, all horizontal, and passes through the points $(1, 1)$, $(3, 5)$, and $(6, 8)$.

26. Below is a graph of the closing prices of Jumparound stock over a period of ten trading days. Answer the following questions referring to the graph.

Price at Closing for Jumparound Stock
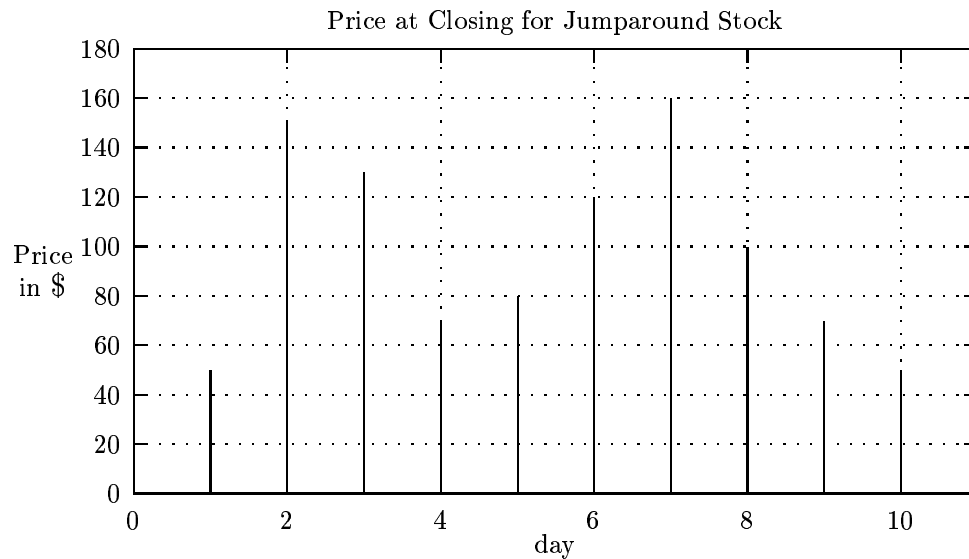
(a) Suppose Mr. Getrich gives his broker orders to buy 10 shares of Jumparound on any day the price is below $80 per share. Does he buy any stock? If so, on what days? How much does he pay for all the stock he buys?

(b) Suppose Ms. Makemore gives her broker orders to sell 50 shares of her Jumparound stock on any day the price is $100 a share or more. Does she sell any stock? If so, when? How much does she get for all the stock she sells?

27. The following graph illustrates the same hypothetical stock data ("Stock B") that was used in Unit 1 Homework Problem 11. Calculate the average rate of change of the stock in *dollars per day* between the close of trading on day 1 and the close of trading on day 5.

Problem 27, Stock B