MATH 161 — Precalculus[1]
Community College of Philadelphia

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Math 161 — Chapter 3 Homework

1. Graph each of the functions below on graph paper. Show the table of values you use to get the coordinates of the specific points you plotted.

   (a) $f(x) = .2x^2 + 3$

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

   (c) $h(x) = (x-1)^2 - 2$

   (d) $p(t) = (t-2)(t+1)$

2. Write each of the following quadratic functions in the form $f(x) = ax^2 + bx + c$ and give the values of a, b, and c.

   (a) $f(x) = (x-2)^2 - 3$

   (b) $g(x) = .5(x+1)^2 + 12$

   (c) $h(x) = (x+2.5)^2 + x^2 - 4x$

   (d) $u(x) = 43 - 5(-3+x)^2$

   (e) $w(x) = (x-4)(x+5)$

   (f) $z(x) = -3(x-2)(x-6) + 18$

3. For each of the following functions complete the square to put the function in the form $f(x) = a(x-h)^2 + k$, and give the values of the constants a, h, and k.

   (a) $f(x) = x^2 + 4x + 3$

   (b) $g(x) = x^2 - 8x + 1$

   (c) $h(x) = x^2 - 6x - 18$

   (d) $q(x) = x^2 + 3x + 2.5$

   (e) $s(x) = 3x^2 - 18x + 3$

   (f) $t(x) = 4x^2 + 20x - 8$

4. Find the roots (if there are any) of each of the following quadratic functions:

   (a) $f(x) = (x+3)(x+5)$

   (b) $g(x) = x^2 - 5x + 6$

(c) $h(x) = 3x^2 + 2x + 1$

(d) $q(x) = 4(-1 + x)(x - 4)$

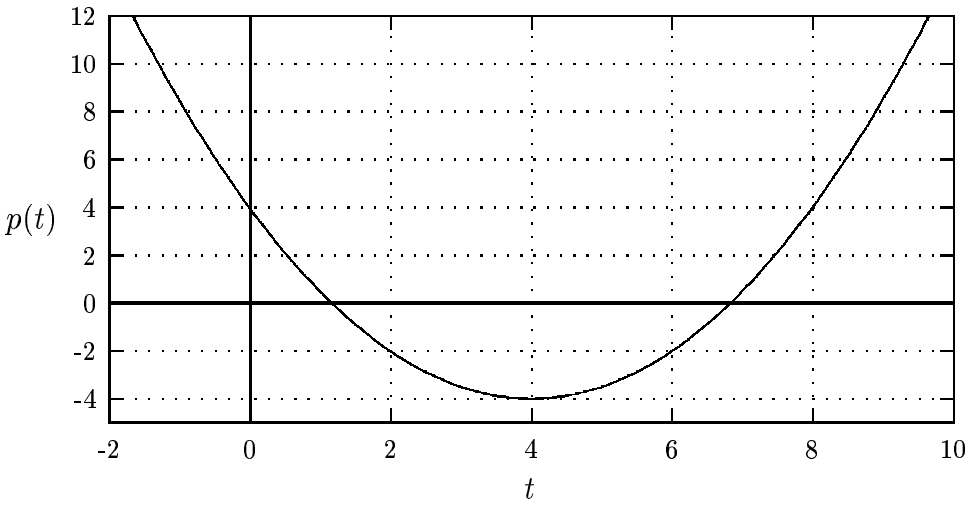
(e) $s(x) = -(x - 3.4)x$

(f) $t(x) = -(x - 2)^2 + 3$

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

5. A quadratic function $p(t)$ is illustrated in the following graph.

Problem 5



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

(a) $[4, 6]$

(b) $[6, 8]$

(c) $[2, 4]$

(d) $[0, 2]$

(e) $[2, 6]$

(f) $[3.5, 4.5]$

(g) $[9.15, 9.45]$

6. Consider the quadratic function $f(x) = 3x^2 + 2x - 6.2$. Calculate the average rate of change of the function $f(x)$ with respect to x over the following intervals:

(a) $[-8, -6]$

(b) $[-6, -4]$

(c) $[-4, -2]$

(d) $[-2, 0]$

(e) $[-1, 1]$

(f) $[0, 2]$

(g) $[2, 4]$

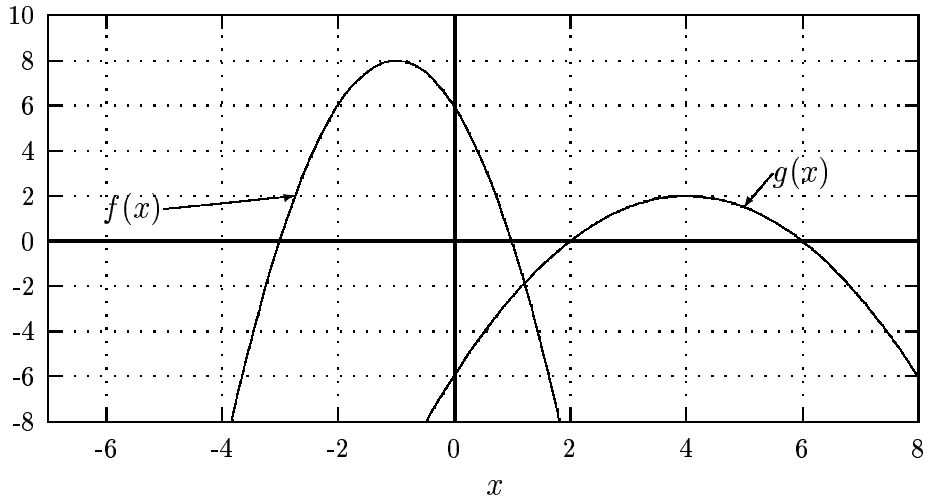
(h) $[4, 6]$

(i) $[6, 8]$

Examine your results for patterns and describe any that you see.

7. Examine the graphs of the quadratic functions $f(x)$ and $g(x)$ that are illustrated below.

Problem 7



(a) Give the y-intercepts, if any, of the function $f(x)$.

(b) Give the vertex of the function $f(x)$.

(c) Give all roots of the function $f(x)$.

(d) Give the y-intercepts, if any, of the function $g(x)$.

(e) Give the vertex of the function $g(x)$.

(f) Give all roots of the function $g(x)$.

8. Write the formula of a quadratic function satisfying the given conditions. Use your favorite letters for the names of the functions.

   (a) The graph has x-intercepts 1 and 5, and y-intercept 3.

   (b) The graph has roots 2 and -2, and y-intercept 2.

   (c) The graph has the single x-intercept 2 and y-intercept -8.

   (d) The graph has the single x-intercept -3 and y-intercept 10.

   (e) The graph has roots -1 and 5 and goes through the point $(1, -12)$.

9. Sketch the graph of a quadratic function which has roots -6 and 0, and a positive coefficient of x^2.

10. Sketch the graph of a quadratic function which has a y-intercept -2 and vertex $(3, 4)$.

11. Write a formula for the quadratic function you sketched in Problem 10

12. For each of the following descriptions of a parabola, decide whether there exists a quadratic function with such a parabola for its graph. If so, sketch its graph. If not, explain why not.

   (a) vertex (5,4), y-intercept 5

   (b) roots -2 and 4 and y-intercept 9.5

   (c) roots -3 and 3, vertex (-4,6)

   (d) roots -4 and 0, vertex (-3.5,-6)

   (e) increasing for $x < -1$, decreasing for $x > -1$, vertex (-1,2)

13. Use interval notation to write:

   (a) an open interval of length 3

   (b) an open interval of length 0.5

   (c) an open interval of length 0.03

   (d) a closed interval of length 1.7

   (e) a closed interval of length 5.2

   (f) a closed interval of length 0.07

14. For each quadratic function, give the requested information.

    (a) Find the roots of $f(x) = 2\left(x + \frac{3}{2}\right)(x + 41)$.

    (b) Find the vertex of $g(x) = (x - 2.5)^2 + \pi$.

    (c) The y-intercept of $h(x) = 2(x^2 + 3x - 4.5)$.

    (d) Which way does the function h above open — up or down?

    (e) Which way does the function g above open — up or down?

    (f) Which way does the function f above open — up or down?

    (g) Find the roots of the function h above.

    (h) Find the y-intercept of the function f above.

    (i) Find the roots of the function g above.

15. Give the range of the two illustrated quadratic functions, f and g. (Assume, as usual for quadratic functions, that the domain is all real numbers.)

Graph for Problem 15