This test is take-home, so you may use your notes, book, Excel, MathGV, etc. This test is due back to me at the beginning of class on Tuesday, June 9, 2009. Late tests will not be accepted. Don’t forget to simplify all of your answers and attach your work!

1. Find the vertices of the functions:
   a) \( f(x) = 3x^2 - 24x + 31 \)
   b) \( f(x) = 2.9(x - 8.2)^2 - 9.3 \)

2. Graph the following function: \( f(x) = x^2 - 8x + 12 \)

3. Solve for \( x \), if possible: \( 3x^2 - 7x = 9 \)

4. Graph the following function: \( f(x) = -2(x - 1)^2 + 7 \)

Given \( f(x) = 2x + 8 \) and \( g(x) = 4x - 5 \), find the following.

5. \( (f - g)(x) \)
6. \( (f \circ g)(x) \)
7. \( (f \cdot g)(x) \)
8. \( (f + g)(x) \)

9. The number of CDs sold in a given year can be approximated by \( D(x) = 2x^3 - 27x^2 + 172x + 391 \), where \( x \) represents the number of years since 1992. The number of cassettes sold in a given year can be approximated by \( C(x) = 2x^3 - 104x^2 + 1234x + 2900 \).
   a) Were there more CDs or cassettes sold in 1995? 
   b) Find the polynomial that represents how many more CDs than cassettes were sold in a given year.

10. A health food company determines that its daily profit \( P(x) \) for selling \( x \) bottles of a new vitamin is modeled by \( P(x) = 84x - 0.5x^2 \).
    a) What is the profit if 24 bottles are sold on a day? 
    b) How many bottles would the company need to sell on a day to maximize their profit?
11. Find the equation of the parabola having a vertex of (3, -6) and passing through (2, -4).

12. A homeowner wants to build a rectangular patio where the length of the patio is 10 feet longer than the width. If area of the patio is 144 ft², what are the dimensions of the patio?

13. A stone is thrown downwards from a bridge 800 feet off of the ground at a velocity of 20 feet per second. Let “h(t)” represent the height of the stone after “t” seconds, and use \( h(t) = -16t^2 + v_0t + h_0 \).
   a) Find \( h(t) \).
   b) What is the height of the stone after 5 seconds?
   c) How long does it take the stone to hit the ground?

14. A toy manufacturer determines that the daily cost for producing “x” units of a toy truck can be approximated by \( C(x) = 0.005x^2 - x + 100 \).
   a) How many trucks must be produced in order to minimize the daily cost?
   b) What is the minimum cost?
   c) How much does it cost to produce 225 trucks?

15. Given the graph of the quadratic equation at the right, find:
   a) the vertex of the equation ________________________
   b) \( f(3) = \) ______
   c) the equation of the parabola _________________________
   d) the x-intercepts of the equation __________, __________

16. The number of Krispy Kreme stores in operation for “x” years after 1999 can be approximated by the function \( K(x) = 7x^2 + 8x + 131 \).
   a) How many Krispy Kreme stores were in operation in 2008?
   b) During what year did Krispy Kreme celebrate the opening of its 500th store?