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 Monday, September 8, 2008. Late tests will not be accepted. Don’t forget to simplify all of your answers and attach your work!

1. Add: \( \frac{3}{x-4} + \frac{7}{x} \)

\[
\frac{10x - 28}{x(x - 4)}
\]

2. Subtract: \( \frac{8}{x+3} - \frac{5}{x - 8} \)

\[
\frac{3x - 79}{(x + 3)(x - 8)}
\]

3. Find the vertices of the functions:
   a) \( f(x) = -5x^2 + 20x - 28 \)
   
   \( (2, -8) \)
   
   b) \( f(x) = -4.5(x + 2.8)^2 - 8.7 \)
   
   \( (-2.8, -8.7) \)

4. Graph the following function: \( f(x) = 2x^2 + 12x + 13 \)

5. Solve for \( x \), if possible: \( 3x^2 - 2x = 14 \)

\[ x \approx 2.5191; -1.8525 \]

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

Given \( f(x) = 2x + 4 \) and \( g(x) = 5x - 7 \), find the following.

7. \((f - g)(x)\)

\[ -3x + 11 \]

8. \( \left( \frac{f}{g} \right)(x) \)

\[ \frac{2x + 4}{5x - 7} \]

9. \((f \circ g)(x)\)

\[ 10x - 10 \]

10. \((g \circ g)(x)\)

\[ 25x - 42 \]

11. If there are \( x \) teams in a sports league and all of the teams play each other exactly once, the total number of games played is given by \( P(x) = 0.5x^2 - 0.5x \).

   a) How many games must be scheduled to play if there are 12 teams competing this year?

   b) Last year, there were 36 total games played. How many teams competed in the league last year?

   66 games

   8 teams
12. Your company uses the quadratic model \( y = -4x^2 + 325x + 752 \) to represent how many units \( y \) of a new product will be sold \( x \) weeks after its release.

a) How many units can you expect to sell immediately upon release?

752 units

b) How many units can you expect to sell 42 weeks after release?

7346 units

13. Find the equation of the parabola having a vertex of \((2, -3)\) and passing through \((1, 0)\).

\[ y = 3(x - 2)^2 - 3 \]

14. A function provides the following data. What is the degree of the function?

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
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<td>9</td>
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<tr>
<td>2</td>
<td>30</td>
</tr>
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<td>4</td>
<td>156</td>
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<tr>
<td>5</td>
<td>285</td>
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</tbody>
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Degree 3

15. A bottle rocket is launched upwards from the ground. Its distance in feet from the ground in “t” seconds is given by \( d(t) = -16t^2 + 512t \).

a) At what times will the ball be 0.5-mile from the ground? (1 mile = 5280 feet)

36.518 seconds

b) What is the maximum height of the ball?

4096 feet

16. A billboard is 12 feet longer than it is high. The billboard has 405 square feet of advertising space. What are the measurements of the billboard?

15 feet by 27 feet

17. Given the graph of the quadratic equation at the right, find:

a) the x-intercepts of the equation \((-3, 0) \text{ and } (1, 0)\)

b) the y-intercept of the equation \((0, 9)\)

c) the vertex of the equation \((-1, 12)\)

d) \( f(-2) = 9 \)

e) the equation of the parabola \( y = -3(x + 1)^2 + 12 \)