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 Thursday, June 2, 2011. Late tests will not be accepted. Don’t forget to simplify all of your answers and attach all of your work!

1. Given \( f(x) = 7x + 5 \) and \( g(x) = 3 – 8x \), find the following:
   a) \( (f + g)(x) \)  
   b) \( (f – g)(x) \)  
   c) \( (f \cdot g)(x) \)  
   d) \( (f \circ g)(x) \)

2. Factor completely.
   a) \( x^2 – 10x + 24 \)  
   b) \( 14x^2 + 13x – 12 \)  
   c) \( 16x^2 – 81 \)

3. Simplify: \( \frac{x^2 – 2x – 15}{x^2 – 7x + 10} \)

4. Multiply and simplify: \( \frac{x + 7}{x^2 + x - 2} \cdot \frac{x^2 - 1}{x^2 + 4x - 21} \)

5. Divide and simplify: \( \frac{x + 2}{x^2 - 3x - 4} \div \frac{x^2 - 2x - 8}{3x^2 + 3x} \)

6. Add and simplify: \( \frac{5}{x + 7} + \frac{13}{x + 1} \)

7. Subtract and simplify: \( \frac{4}{x - 3} - \frac{7}{x} \)

8. Find the vertices of the functions:
   a) \( f(x) = 3.6(x - 4.1)^2 + 13.2 \)
   b) \( f(x) = 5x^2 + 20x + 13 \)
9. Graph the following function: \( f(x) = 3x^2 - 6x - 3 \)

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10. Solve for \( x \), if possible: \( 4x(x + 5) = 9 \)

11. Graph the following function: \( f(x) = -2(x + 3)^2 + 4 \)

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12. A bottle rocket is launched vertically upward with a velocity of 120 feet per second from a back porch deck that is 10 feet off of the ground. Use the formula \( h(t) = -16t^2 + v_0t + h_0 \) to answer the following questions.

a) Find the equation \( h(t) \) that represents the height of the ball after \( t \) seconds.

b) How high is the rocket after 3 seconds?

c) How long does it take for the rocket to hit the ground?

d) How long does it take the rocket to reach its highest distance above the ground?

e) What is the highest distance above the ground that the rocket reaches?

13. Bill owns a watch repair shop and has found that the daily cost of operating his shop is given by the function \( C(x) = 2x^2 - 136x + 51 \), where \( x \) is the number of watches repaired each day.

a) How many watches must he repair each day in order to minimize his costs for the day?

b) What would be the costs for operating his shop if he repairs 30 watches on a given day?