Sample Final Exam Questions

1. (10 points) True or False? (Circle your answer)
   a) $8^{-\frac{2}{3}} = -4$  
      T  
      F
   b) $7^0 = 0$  
      T  
      F
   c) $\log_{\frac{1}{2}}(64) = -6$  
      T  
      F
   d) $\log_{10}(100) + \log_{10}(1000) = \log_{10}(10000)$  
      T  
      F
   e) $\log_{\frac{4}{3}}\frac{4}{3} = 1$  
      T  
      F

2. (10 points) If $f(x) = 3x^2 + 1$ and $g(x) = 4x + 5$, find:
   a) $g(f(4))$  
   b) $f(x + 2)$  
   c) $f(x) + 2$  
   d) $g(f(x + 1))$

3. (15 points) Solve these equations. Please show your work.
   a) $5x^2 = 7x + 8$  
   b) $(x + 3)^2 = 36$  
   c) $x^2 + 7x = 0$

4. (10 points) A ball is thrown directly upward from the top of a 200-foot building. The ball’s height above the ground, $s$ (in feet), $t$ seconds after it is thrown is modeled by $s = -16t^2 + 40t + 200$.
   a) Will the ball ever reach a height of 240 feet? Explain why or why not.
   b) Will the ball ever reach a height of 225 feet? How often does this occur? Explain what this means in terms of the path that the ball follows.

5. (10 points) Graph the function $y = 2x^2 - 12x + 16$
   a) What is its vertex?
   b) What is its axis of symmetry?
   c) What are the $x$-intercepts?
   d) What are the $y$-intercepts?
   e) Is the vertex a maximum or a minimum?

6. (15 points) Solve these equations:
   a) $2 + \ln(x) = 0$
   b) $\log_6(x) + \log_6(x - 2) = 1$
   c) $6^{1-x} = 7^{2x+1}$

7. (10 points) Laddoninium is a new element. If you start with 500 pounds of it, after $t$ second, you have $A = 500e^{-0.03t}$ pounds of it left.
   a) How much of it remains after 100 seconds?
   b) What is its half-life (that is, how long before half of what you started with remains?)
8. (10 points) **Complex Numbers** - Perform the following operations:
   a) \((3 + 5i) - (8 - 2i)\)
   b) \((3 + 5i)\)
       \((8 - 2i)\)
   c) \((3 + 5i)(8 - 2i)\)

9. (10 points) **Word Problem**:

   Working together, Marcella and Richard can complete a job in 6 days. Working alone, it takes Richard 5 days longer than Marcella to do the job. How long does it take Marcella to do the job if she works alone?

**EXTRA CREDIT**:
(5 points) From an old algebra book:

Simplify as much as possible:

\[
\sqrt[6]{\frac{9^n + 27^n}{3^n + 9^n}}
\]

Looking at this now? I think questions about conic sections are missing.

There will be some ch. 10 questions also!