April 26, 2010   Professor Ilya Kofman

NAME: _____

1. **(a)** (*16 points*) A ball is thrown upwards from a height of 20 ft with an initial velocity 32 ft/sec. The height of the ball after t seconds is given by

$$h(t) = -16t^2 + 32t + 20.$$

   (i) Find the maximum height the ball will reach, and the time it reaches the maximum height.

   (ii) Find the time when the ball hits the ground.

   (b) (*5 points*) Solve the following inequality: $\left| \dfrac{1}{5}x - 3 \right| < \dfrac{3}{2}$

2. **(a)** (*12 points*) Let $f(x) = 3x^2 + 12x + 10$. Determine if f has an absolute maximum or minimum and find it. Find the vertex and axis of symmetry of the graph $y = f(x)$. Use this information to sketch the graph.
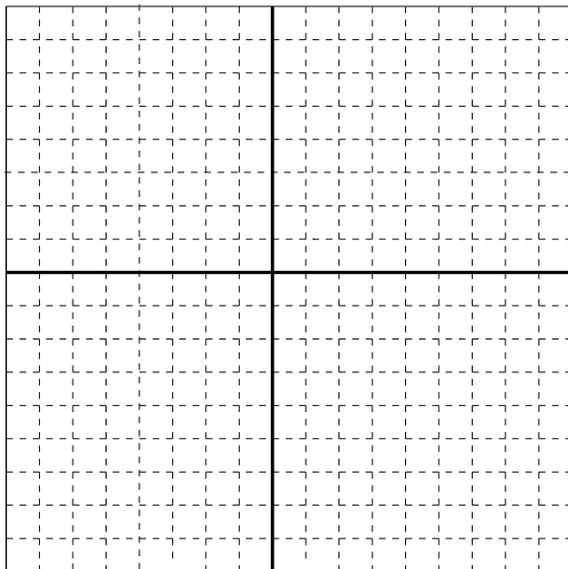
(b) (*8 points*) Complete the square and write the function $f(x) = 2x^2 - 6x + 5$ in the form $f(x) = a(x - h)^2 + k$.

3. (a) (*10 points*)

(i) The radioactive element carbon-14 has half life of 5750 years. Find its exponential decay rate.

(ii) A mummy discovered in a pyramid in Egypt has lost 45% of its carbon-14. Determine its age.

(b) (*10 points*) If $\ln a = 3, \ln b = 4, \ln c = -5$, evaluate the following expressions.

(a) $\ln \dfrac{b^3}{c^2}$

(b) $\ln \sqrt[3]{abc}$

4. (*21 points*) Solve the following equations.

   (a) $3^{4x+5} = 9$

   (b) $3^{x+2} = 4^{3x}$

   (c) $\log_3(5 + 2x) = 2$

5. (*18 points*) Match the functions with their graphs.

1) $y = x^2 - 3x - 3$ Graph: _____	**4)** $y = 5x - x^2 - 4$ Graph: _____
2) $y = 4^x - 5$ Graph: _____	**5)** $y = 3 - 4^x$ Graph: _____
3) $y = \log_2(4x + 8)$ Graph: _____	**6)** $y = \ln(x + 4) - 1$ Graph: _____