Multiple Choice non calculator: circle the correct letter [2 pts each]

1. Find the slope of the line determined by points \( A(8, -2) \) and \( B(2, 7) \).
   
   A. \( \frac{-2}{3} \)  
   B. \( \frac{2}{3} \)  
   C. \( \frac{3}{2} \)  
   D. \( -\frac{3}{2} \)  
   E. \( -2 \)

2. If the function \( f(x) \) is defined by \( f(x) = x^3 - 1 \), then \( f^{-1} \), the inverse function of \( f(x) \), is defined by \( f^{-1}(x) = \) ___?
   
   A. \( \frac{1}{\sqrt{x}+1} \)  
   B. \( \frac{1}{\sqrt{x}-1} \)  
   C. \( \sqrt[3]{x-1} \)  
   D. \( \frac{1}{\sqrt[3]{x}-1} \)  
   E. \( \frac{1}{\sqrt{x}+1} \)

3. Which of the following defines a function \( f \) for which \( f(-x) = -f(x) \)?
   
   A. \( f(x) = x^3 \)  
   B. \( f(x) = \sin x \)  
   C. \( f(x) = \cos x \)  
   D. \( f(x) = \log x \)  
   E. \( f(x) = e^x \)

4. \( \ln(x - 2) < 0 \) if and only if:
   
   A. \( x < 3 \)  
   B. \( 0 < x < 3 \)  
   C. \( 2 < x < 3 \)  
   D. \( x > 2 \)  
   E. \( x > 3 \)

5. If \( p(x) = (x + 2)(x + k) \) and if the remainder is 12 when \( p(x) \) is divided by \( x - 1 \), then \( k = \) ___?
   
   A. 2  
   B. 3  
   C. 6  
   D. 11  
   E. 13

6. If \( f(x) = \frac{4}{x-1} \) and \( g(x) = 2x \), then the solution set of \( f(g(x)) = g(f(x)) \) is ___?
   
   A. \( \left\{ \frac{1}{3} \right\} \)  
   B. \( \{2\} \)  
   C. \( \{3\} \)  
   D. \( \{-1, 2\} \)  
   E. \( \left\{ \frac{1}{3}, 2 \right\} \)

7. Let \( g(x) = x^2 - 2 \) and \( f(x) = \sqrt[3]{x+2} \). Which of the following are true?
   
   I. \( g(x) = f^{-1}(x) \) for all real values of \( x \).
   II. \( (f \circ g)(x) = 1 \) for all real values of \( x \).
   III. The function \( f \) is one-to one.
   
   A. I and II  
   B. I and III  
   C. II and III  
   D. III only  
   E. I, II, and III
Free Response calculator portion. In order to receive full credit, you must show all your work. No work, no credit. If you use a graph from the calculator to answer a question, explain what features of the graph helped you to answer the question.

1. [4 pts] Let \( L \) represent the line \( y = \frac{3}{5}x + 7 \). Write an equation for the line through \( P(6, -4) \) that is a) parallel to \( L \) and b) perpendicular to \( L \).

a) ____________

b) ____________

2. [2 pts] Describe how the graph of \( x = y^2 + 6y + 5 \) can be obtained from the graph of \( x = y^2 \).

3. [4 pts] Let \( f \) be the function defined by \( f(x) = x^2 \). Using \( f \), define the function \( g \) by:

\[ g(x) \text{ as the slope of the straight line through } (x, f(x)) \text{ and } (x+1, f(x+1)) \].

a) Find \( g(-1) \)

b) Find \( g(3) \)

c) Find \( g(x) \)

4. a. [1 pt] Sketch a graph which continues to increase at an increasing rate.

b. [1 pt] Sketch a graph which continues to increase at a decreasing rate.

a. 

b. 
5. [2 pts] Suppose that in any given year, the population of a certain endangered species is reduced by 25%. If the population is now 7500, in how many years will the population be 4000? (Recall that \( P = P_0 (1 \pm r)^t \).)

6. [3 pts] Draw the graph of a function \( f(x) \) satisfying the following conditions:
   - As \( x \to \infty \), \( f(x) \to 0 \),
   - As \( x \to -\infty \), \( f(x) \to \infty \),
   - The roots of \( f(x) \) are -3, 1, and 2.

7. [4 pts] For \( g(x) = x^2 + 2x + 3 \) and \( f(x) = x^2 + 1 \), find and simplify:
   a. \( [f(t)]^2 + 1 \)
   b. \( g(2 + h) - g(2) \)

8. [5 pts] Given the graph of \( y = h(x) \) to the right:
   a) Sketch a graph of:
      (i) \( y = h^{-1}(x) \)
      (ii) \( y = \frac{1}{h(x)} \)
   b) What becomes of the asymptote when you sketch the inverse function?