Part I. Show Your Work. Fully simplify all solutions. For these problems you must show a complete and valid solution method for full credit.

1. [20 points] Find all the solutions to the following equations.

(a) \(3(2x - 3)^2(5x - 6) - (2x - 3)(5x - 6)^2 = 0\)

(b) \(\sqrt{5 - x} + 1 = x - 2\)

Answer (a): ______________________________________

Answer (b): ______________________________________
2. [25 points] A ball is thrown straight upward at an initial speed of 64 feet/second. Assume the ball begins its travel from ground level. The ball's height is determined by the equation

\[ h(t) = -16t^2 + 64t \]

(a) When is the ball at or above 48 feet? Set up and solve an inequality to answer this question.

Answer (a): ________________________________

(b) What is the highest point the ball reaches, and when does it reach it? Be sure to give your answers with the correct units.

Answer (b): ________________________________

(c) For how long is the ball in the air?

Answer (c): ________________________________

[This problem continues on the next page.]
(cont.) The ball’s height is determined by the equation $h(t) = -16t^2 + 64t$.

(d) Graph the height of the ball as a function of time. Label the coordinates of any $x$-intercepts or $y$-intercepts and any local minimums or maximums.

(e) Find the average rate of change of the height of the ball from $t = 3$ seconds to $t = 4$ seconds. Be sure to give your answer with the correct units. What does the ARC represent in the context of the problem?

Answer (e): __________________________________________

3. [20 points] Given the functions $f(x) = \frac{2}{x + 3}$ and $g(x) = \frac{x}{x + 2}$, answer the following.

(a) Find the difference quotient $\frac{f(a + h) - f(a)}{h}$ of the function $f(x)$.

Answer (a): ________________________________

[This problem continues on the next page.]
Given the functions $f(x) = \frac{2}{x+3}$ and $g(x) = \frac{x}{x+2}$, answer the following.

(b) Find the inverse function of $g(x)$.

(c) Find $f(g(x))$ and simplify.

(d) Find the domain of $f(g(x))$.

Answer (b): ________________________

Answer (c): ________________________

Answer (d): ________________________
4. [15 points] A 10-foot long stem of bamboo is broken in such a way that its tip touches the ground 3 feet from the base of the stem, as shown in the figure. Answer the following questions to determine height of the break. You will receive no credit for guessing the answer.

(a) Find $y$ in terms of $x$.

Answer (a): __________________________

(b) Use the Pythagorean Theorem to set up a quadratic equation in terms of $x$ only.

Answer (b): __________________________

(c) Solve your equation from part (b) to find the height of the break.

Answer (c): __________________________
Part II. Multiple Choice. [5 points each, 20 points total] These problems will be graded on your answers only.

5. Circle ALL of the conditions that are applicable to the domain of \( f(x) = \frac{\sqrt{x+6}}{3x-2} \).
   
   A. \( x + 6 \neq 0 \)  
   B. \( x + 6 > 0 \)  
   C. \( x + 6 \geq 0 \)  
   D. \( 3x - 2 \neq 0 \)  
   E. \( 3x - 2 > 0 \)  
   F. \( 3x - 2 \geq 0 \)

6. Which one of the following is the least common denominator of \( \frac{2}{x} + \frac{3}{x-1} - \frac{4}{x^2-x} \)?
   
   A. \( x \)  
   B. \( x-1 \)  
   C. \( x(x^2-x) \)  
   D. \( x(x-1) \)  
   E. \( x(x+1)(x-1) \)  
   F. \( x(x-1)(x^2-x) \)

7. Henry is working out by riding his bike. He starts by biking slowly at a constant rate. Then he gradually increases his speed until he reaches his peak. He maintains this peak speed for the rest of his workout. Circle the letter corresponding to the graph that best represents this scenario.

   ![Graphs A, B, C, D]

8. The graph of a function \( g(x) \) is shown below to the left. The function \( h(x) \) is a transformation of \( g(x) \) and is shown below to the right. Which one of the following is the correct equation for \( h(x) \)?

   ![Graphs g(x), h(x)]

   A. \( h(x) = -g(x) + 2 \)  
   B. \( h(x) = g(-x - 2) \)  
   C. \( h(x) = -g(x + 2) \)  
   D. \( h(x) = -g(x - 2) \)