True or False (2 points each).

Instructions: Indicate whether the following statements are true or false.

1. If \( f(3) = 5 \) then \( f^{-1}(5) = -3 \).
2. For every positive real number \( x, \frac{\log_3(2x)}{\log_3(x)} = 2 \).
3. The range of \( f(x) = 2^x \) is the same as the domain of \( g(x) = \log_2(x) \).
4. The y-intercept of the graph of \( h(x) = \left(\frac{1}{3}\right)^x \) is \((0,1)\).
5. The graph of \( k(x) = \frac{3x^2 - 2x}{x - 3} \) has a horizontal asymptote at \( y = 0 \).
6. \( \log_2(1) = 2 \).

Short Answer (4 points each).

Instructions: Answer each of the following questions to the best of your ability. Please show all relevant work. Partial credit will not necessarily be given.

1. List all possible rational zeros of \( P(x) = 2x^3 - 3x^2 + 2 \).

2. Find the domain of \( f(x) = \log_7(-2x + 4) \).

3. Sketch the graph of \( f(x) = 3^x \). Be sure to label two points on the graph.

4. Solve for \( x \) algebraically: \( 3^x = 4^{x+1} \).
5. Let \( f(x) = (x - 4)^2 (x + 2)^3 \).
   a) Find all the zeros of \( f \).
   
   b) Find the multiplicity of each of these zeros.

6. Write the given logarithm in terms of logarithms of \( x \) and \( y \) only: \( \log_2 \left( \frac{x^3}{\sqrt{y}} \right) \)

**Long Answer (8 points each).**

**Instructions:** Answer each of the following questions to the best of your ability. Please show all relevant work. Partial credit will be given when earned (guessing will not earn any credit).

1. Let \( f(x) = \frac{x-2}{x+3} \), complete the following:
   a) Find the domain of \( f \).
   
   b) Find \( f^{-1}(x) \).
   
   c) Find the domain of \( f^{-1}(x) \).

2. Sketch the graph of \( g(x) = 2 - \log_3(x-1) \) using ONLY transformations of \( f(x) = \log_3(x) \). Be sure to label two points on the graph.
3. Let \( f(x) = \frac{3 - x}{2x + 3} \).
   a) Find all intercepts for the graph of \( f \).
   
   b) Find any horizontal asymptotes of the graph.
   
   c) Find any vertical asymptotes of the graph.
   
   d) Sketch the graph \( f \). Label all intercepts and asymptotes.

4. Find a polynomial function, \( P \), with integer coefficients such that: \( c_1 = 0 \) and \( c_2 = 2 + i \) are zeros of \( P \). Be sure to expand \( P \) completely.

5. Solve algebraically for \( x \): \( \log_3(x - 8) + \log_3(x) = 2 \).