TEST 6 - MATH 140

DATE: Friday, February 17

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 5 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Consider the polynomial function $f(x) = x^3 + 6x^2 + 6x - 4$.

   (a) List all potential rational zeros of f. (1 point)

   (b) Determine which of these are actual zeros of f. (2 points)

   (c) Factor f. (2 points)

2. Consider the two functions $f(x) = \frac{x-3}{x+5}$ and $g(x) = \sqrt{1-x}$.

   (a) Find the domain of f and the domain of g. (1 point)

   (b) Find a formula for the composite $(g \circ f)(x)$. (1 point)

   (c) Give the conditions that must be satisfied by x for x to be in the domain of $g \circ f$. (1 point)

   (d) Use these conditions to actually find the domain of $g \circ f$. (2 points)

3. Consider the rational function $f(x) = \frac{x+2}{2x+3}$.

   (a) Find the domain of f. (1 point)

   (b) Find a formula for the function $f^{-1}(x)$. (2 points)

   (c) Find the domain of f^{-1}. (1 point)

   (d) Find the ranges of both f and f^{-1}. (1 point)

4. Consider the function $f(x) = 3^x$.

   (a) Make a rough sketch of the graph of f. (1 point)

   (b) Describe the transformations that may be used to pass from f to the function $g(x) = 5 - 3^{(1/2)x}$. (2 points)

   (c) Use the transformations of the previous part and the graph you sketched in the first part to obtain a rough sketch of the graph of g. (2 points)

5. Solve the following exponential equations:

   (a) $27^{x^2 - 2x} = \frac{1}{3}$ (2 points)

   (b) $81^x \cdot 3^{x^2} = 9^6$ (3 points)