

EXAM 4 - MATH 140

DATE: Friday, October 27

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. Solve the following rational inequalities:

(a) $\frac{x^3+x^2-2x}{x^2+6x-7} \leq 0$ (3 points)

(b) $\frac{1}{x+5} > \frac{1}{3x+1}$ (2 points)

2. Consider the two functions $f(x) = \frac{1}{x-3}$ and $g(x) = \sqrt{10-7x}$.

(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 function $f(x) = (\frac{1}{2})^x$.

(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 $g(x) = 2^{-x-1} + 3$. (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)

4. Solve the following exponential equations:

(a) Calculate the values of the expressions $\log_{\sqrt{3}} 27$ (0.5 points) and $\log_5 \sqrt[13]{25}$. (0.5 points)

(b) Find the domain of the function $f(x) = \log_3 \frac{5x-x^2}{x-1}$. (2 points)

(c) Write the expression $\log_3 \left[\frac{(x-4)^2}{x^2-1} \right]^{2/3}$ as a sum/difference of logarithms. Expand **as much as you can**. (0.5 points)

(d) Write as a single logarithm the expression $3 \log_2 (3x+1) - 2 \log_2 (2x-1) - \frac{1}{3} \log_2 x$. (0.5 points)

(e) Solve the equation $\log_3 (x^2 - 1) = 2$. (1 point)

5. (a) Solve the exponential equation $(4^5)^{x^2} = \frac{1}{8} \cdot (\frac{1}{2^x})^{11}$. (2 points)

(b) Solve the logarithmic equation $\log_6 (x+3) + \log_6 (x+4) = 1$. (3 points)