

## EXAM 2 - MATH 111

DATE: Monday, October 10

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. Each question is worth 3 points. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Consider the function  $y = f(x)$  whose graph is given in the following figure.
  - (a) Find the domain  $\text{Dom}(f)$  and the range  $\text{Ran}(f)$ .
  - (b) Find the intervals of monotonicity for  $f$  (where it is increasing or decreasing) and the relative extrema (minima or maxima) of  $f$ .
  - (c) Find the intervals of concavity and the inflection points of  $f$ .
  - (d) Summarize your conclusions of Parts (b) and (c) in a tabular form.
2.
  - (a) Find the domain and sketch the graph of the function  $f(x) = \sqrt{x}$ .
  - (b) Use transformations to graph  $g(x) = \sqrt{-x+2} + 3$ . Give me a detailed step-by-step description of all transformations involved and of the resulting graphs.
3. Consider the function  $f(x) = \frac{1}{x}$ . Find the formula of the function whose graph is the graph resulting from that of  $f$  after moving it 2 points to the right, vertically stretching it by a factor of 3, flipping it with respect to the  $x$ -axis and, finally, moving it 5 points up. Give me a detailed step-by-step description of the transformations performed and the resulting formulas. (You do *not* need to graph.)
4. Suppose that  $f(x) = \frac{5}{x-2}$  and  $g(x) = \frac{1}{x+3}$ .
  - (a) Find  $(g \circ f)(x)$  and *simplify* your formula.
  - (b) Determine the domain  $\text{Dom}(g \circ f)$ .

5. Consider the functions  $f(x) = \frac{1}{x}$  and  $g(x) = \sqrt{2x - 1}$ .
- (a) Determine the domains  $\text{Dom}(f)$  and  $\text{Dom}(g)$ .
  - (b) Find a formula for  $g \circ f$ .
  - (c) Determine the domain  $\text{Dom}(g \circ f)$ .
6. Consider the function  $f(x) = \frac{1}{5x-3}$ .
- (a) Find  $f^{-1}(x)$ .
  - (b) Find the domain  $\text{Dom}(f)$  and the range  $\text{Ran}(f)$ .