PRACTICE 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 $\text{Don}(f)$ 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) Sketch for me the graph of the function $f(x) = \frac{1}{x}$.
   (b) Use transformations to graph $g(x) = -\frac{1}{x-2} - 1$. Give me a detailed step-by-step description of all transformations involved and of the resulting graphs.

3. Consider the function $f(x) = \sqrt[3]{x}$. Find the formula of the function whose graph is the graph resulting from that of f after moving it 4 points to the left, horizontally stretching it by a factor of $\frac{3}{2}$, flipping it with respect to the y-axis and, finally, moving it 7 points up. Give me a detailed step-by-step description of the transformations performed and the resulting formulas.

4. Determine the value of the parameters a and b so that the graph of $f(x) = \frac{a}{x+5} + b$ passes through the points $(-3, 1)$ and $(5, -4)$.

5. (a) If $f(x) = \frac{-1}{x} - 4$, find $\frac{f(x+3)}{x}$ and simplify your formula.
   (b) Consider the functions $f(x) = \frac{1}{x+2}$ and $g(x) = \sqrt{x+1}$.
      i. Determine the domains $\text{Dom}(f)$ and $\text{Dom}(g)$.
      ii. Find a formula for $g \circ f$.
      iii. Determine the domain $\text{Dom}(g \circ f)$.

6. Consider the function $f(x) = \frac{3x-1}{x+7}$.

   (a) Find $f^{-1}(x)$.
   (b) Find the domain $\text{Dom}(f)$ and the range $(\text{Ran}(f)$.