

PRACTICE EXAM 3 - MATH 140

DATE: Friday, October 13

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. Use a small three-point table to sketch the graphs of the functions:
 - (a) $f(x) = x^2$ (1 point)
 - (b) $g(x) = x^3$ (1 point)
 - (c) $h(x) = \sqrt[3]{x}$ (2 points)
 - (d) $k(x) = \frac{1}{x}$ (1 point)
2.
 - (a) Pick 3 points and roughly sketch the graph of $f(x) = \sqrt{x}$. (1 point)
 - (b) Roughly sketch the graph of $g(x) = -x + 1$. (1 point)
 - (c) Find the domain (1 point) and sketch the graph (2 points) of the piece-wise defined function

$$h(x) = \begin{cases} -x + 1, & \text{if } x \leq -1 \\ 1, & \text{if } -1 < x < 1 \\ \sqrt{x}, & \text{if } x > 1 \end{cases}$$

3. Consider the function $f(x) = x^4$. Find the formula for the function whose graph is obtained after the following transformations are **applied in the given series (i.e., one after the other)** to the graph of f .
 - (a) Reflection with respect to x -axis. (1 point)
 - (b) Vertical compression by a factor of 2. (1 point)
 - (c) Horizontal shift to the left by 3 units. (1 point)
 - (d) Reflection with respect to the y -axis. (1 point)
 - (e) Vertical shift up by 7 points. (1 point)
4. Consider the polynomial function $f(x) = (x + 3)(x - 1)^2(x - 5)$.
 - (a) Find the roots of $y = f(x)$ (1 point)
 - (b) Construct the sign table for f . (2 points)
 - (c) Roughly sketch the graph of $y = f(x)$. (2 points)
5. Consider the rational function $f(x) = \frac{-x^3 + 8x^2 - 7x}{(x+3)(x-5)^2}$.
 - (a) Factor the numerator. (0.5 points)
 - (b) Find the domain of f . (0.5 points)
 - (c) Find the x - and the y -intercepts of f . (0.5 points)

- (d) Find the vertical and the horizontal asymptotes of f . (0.5 points)
- (e) Create the sign table for f . (1 point)
- (f) Roughly sketch the graph of $y = f(x)$. (2 points)