

TEST 4 - MATH 140

DATE: Friday, February 3

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.
 - (a) Take into account the sketch of the graph of the function $f(x) = x^3$ in Problem 1.
 - (b) Fill in the rows of the following table indicating the transformation that took place going from left to right and down. (Each 3/4 points)

x^3	_____	$(x - 1)^3$
	_____	$2(x - 1)^3$
	_____	$-2(x - 1)^3$
	_____	$-2(x - 1)^3 + 5$

- (c) Use the previous two parts to sketch the graph of the function $f(x) = -2(x - 1)^3 + 5$ showing the new position of all points picked in Part (a). (2 points)
5. A car rental company offers a daily lease agreement for \$40.00. This price includes the first 100 miles. For every mile thereafter there is a charge of \$0.25.
 - (a) Let x be the miles that a customer drives a day. Find the formula for the function $C(x)$ yielding the daily cost in terms of the number x of miles driven. (2 points)
 - (b) Graph $y = C(x)$. (3 points)