

## HOMEWORK 5 - MATH 140

DUE DATE: Monday, October 3

INSTRUCTOR: George Voutsadakis

Read each problem very carefully before starting to solve it. One part of each homework problem will be chosen at random and graded. Each question is worth 1 point. It is necessary to show your work. Correct answers without explanations are worth 0 points.

GOOD LUCK!!

1. Let  $P = (x, y)$  be a point on the graph of  $y = \frac{1}{x}$ .
  - (a) Express the distance  $d$  from  $P$  to the origin as a function of  $x$ .
  - (b) Use a graphing utility to graph  $d = d(x)$ . Sketch the graph for me.
  - (c) For what values of  $x$  is  $d$  smallest?
2. Use transformations to graph the functions
  - (a)  $f(x) = (x + 2)^4 - 3$
  - (b)  $g(x) = 4 - (2 - x)^3$
3. Find a polynomial function of degree 3 with roots  $-2$  of multiplicity 2 and 4 of multiplicity 1, that passes through the point  $(1, 54)$ .
4. Find the intercepts, form the sign table and then roughly sketch the graph of the polynomial functions
  - (a)  $f(x) = x^2(x - 3)(x + 4)$
  - (b)  $g(x) = (x - 2)^2(x + 2)(x + 4)$
5. Inscribe a right circular cylinder of height  $h$  and radius  $r$  in a cone of fixed radius  $R$  and fixed height  $H$  (see figure on page 263). Express the volume  $V$  of the cylinder as a function of  $r$ .
6. Find the intercepts, find the asymptotes, form the sign table and then roughly sketch the graph of the rational functions
  - (a)  $f(x) = \frac{x^3+1}{x^2+2x}$
  - (b)  $g(x) = \frac{x^2+3x-10}{x^2+8x+15}$
  - (c)  $h(x) = \frac{(x-1)(x+3)}{(x+1)^2(x-4)}$
7. Try to find a rational function that might have the graphs
  - (a) of exercise 40 on page 287,
  - (b) of exercise 42 on page 288.
8. UPS has contracted you to design a closed box with a square base that has a volume of 5000 cubic inches.
  - (a) Find a function for the surface area of the box in terms of the length of its base.
  - (b) Graph the function using a calculator and show me the graph.
  - (c) What is the minimum amount of cardboard that can be used to construct the box?
  - (d) what are the dimensions of the box that minimize the surface area?