

MATH 111 - Exam One - Winter 2020

1. [12pts] Find the center and radius of the circle given by the equation

$$x^2 + 5x + y^2 = 3$$

2. [12pts] Simplify the expression

$$\frac{(w^2\sqrt{x})^5y^6}{x^3y^3z}$$

by writing it in a form in which each variable shows up only once and with a positive exponent.

3. [15pts] Solve the inequality

$$\frac{x - 5}{2x^2 + 5x - 3} \geq 0$$

and express your answer in inequality form, in interval form, and in number line form.

4. [12pts] Simplify the following expression by writing it as a single fraction. Then determine the domain of the expression.

$$\frac{3}{2x - 1} - \frac{x - 3}{x + 1}$$

5. The average number of persons per household in the United States has been decreasing steadily (and linearly) for a number of years. In 1900 there were about 4.76 persons per household on average and in 2010 there were about 2.58 persons per household on average. Answer the two questions below:

5a. [14pts] Assuming that these two data points fall on a line, find an equation for  $y$  (the average number of persons in a household) as a function of  $x$  (the year).

5b. [8pts] Use your equation from (5a) to determine, to the nearest year, when there were 3.00 persons per household on average.

6. [12pts] Solve the equation  $abx^2 + b^2x + a = 0$  for the variable  $a$ .

7. [15pts] Determine the largest value of  $y$  (as an exact answer, not a decimal approximation) that can be produced from real-valued inputs into the equation

$$y = -x^2 + \frac{6}{7}x - 4$$