

MATH 111 - Final Exam

1. [10pts] Create a number line sign chart to determine where the following function is positive, negative, zero, and undefined. Then use that information to sketch a graph of the function:

$$f(x) = \frac{2x - 3}{x^2 - 3x - 4}$$

2. [10pts] If $\log_a(x) = 3$ and if $\log_a(y) = -2$, then what is the value of $\log_a\left(\frac{\sqrt{x}}{y^2}\right)$?

3. [10pts] Use the fact that $x = -2$ is a solution to the equation

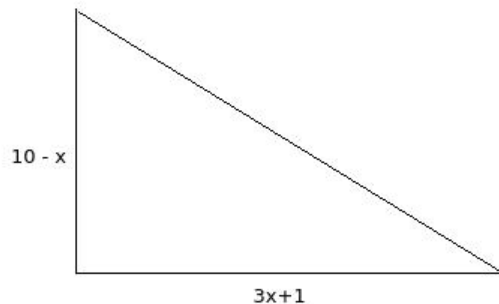
$$x^3 + x^2 - 7x - 10 = 0$$

to find two other solutions. (Give your answers in exact form, not as decimal approximations).

4. [10pts] Find the center and radius of the circle given by the equation

$$x^2 + 4x + y^2 - 5y = 0$$

5. [10pts] A right triangle has legs whose side lengths are described in terms of a variable x . One side of the triangle has a length of $10 - x$ and the other side has a length of $3x + 1$. What is the maximum area for such a triangle and what value of x achieves this maximal area? (Give your answers in exact form).



6. [10pts] Simplify the expression $\frac{2x - 3}{x^2 - 4x - 5} - \frac{2x + 1}{x^2 - 7x + 10}$ by finding the least common denominator to combine the fractions.

7. An ecological restoration project creates new ponds in an effort to increase the local frog population. Suppose a model for the population growth predicts that the population will be described by

$$p(t) = \frac{280}{1 + 27e^{-.3t}}$$

where $p(t)$ is the number of frogs in the population t years after the new ponds were created. Answer the questions below:

7a. [5pts] How many frogs were there in the population the year the ponds were created?

7b. [10pts] How many years after the ponds were created does this model predict the frog population will have risen to 220? (Give both an exact answer and a decimal approximation rounded to the nearest year).

8. [10pts] Determine the domain of the function $f(x) = \sqrt{x^2 - 3x - 10}$.

9. [15pts] A salesman drove from Hood River to Pendleton (a distance of 150 miles) at a constant speed. He then decreased his speed by 15 miles per hour and drove from Pendleton to Walla Walla (a distance of 40 miles). If the total trip took 166 minutes, how fast (to the nearest tenth of a mile per hour) did he drive on the Hood River to Pendleton leg of the trip?