

Math-19 Exam #1

Name: _____

This exam is closed book and notes. You may use a calculator; however, no cell phones or tablets are allowed. Show all work; there is no credit for guessed answers. All values should be exact unless you are specifically asked for an approximate value answer.

1). (20 points) The following questions are related to the classifications of the real numbers:

a). Identify each subset of the real numbers and give an example of an element from each set.

subset	identify	example
\mathbb{N}	_____	_____
\mathbb{Z}	_____	_____
\mathbb{Q}	_____	_____
$\mathbb{R} - \mathbb{Q}$	_____	_____
\mathbb{R}	_____	_____

b). Convert the number $2.\overline{135}$ to rational form.

2). (10 points) Identify each of the following formulas:

$$a^2 + b^2 = c^2$$

$$d = [(x_1 - x_2)^2 + (y_1 - y_2)^2]^{1/2}$$

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$m = \frac{y_1 - y_2}{x_1 - x_2}$$

$$y - y_1 = m(x - x_1)$$

$$y = mx + b$$

$$Ax + By + C = 0$$

$$m_1 = m_2$$

$$m_1 m_2 = -1$$

$$(x - h)^2 + (y - k)^2 = r^2$$

$$x^2 + Ax + y^2 + By + C = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- 3). (20 points) You have two dogs: Fido and Fluffy. Each dog is tied to its own stake in your backyard by a leash. Fido's stake and leash allow him to roam around an area defined by:

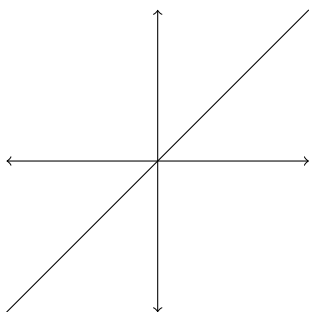
$$(x - 2)^2 + (y - 1)^2 = 9$$

Fluffy's stake and leash allow her to roam around an area defined by:

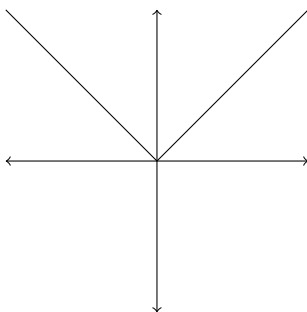
$$x^2 + y^2 - 10x - 8y + 37 = 0$$

- a). What are the coordinates of Fido's stake and the length of his leash?
- b). What are the coordinates of Fluffy's stake and the length of her leash?
- c). What is the equation of the line between the two stakes, in slope-intercept form?
- d). It is mating season. Fido and Fluffy are not fixed, but you do not want them to mate. To be safe, you decide to erect a straight wall that is perpendicular to the line joining the two stakes and going through the midpoint of that line. What is the equation of the wall, in slope-intercept form?

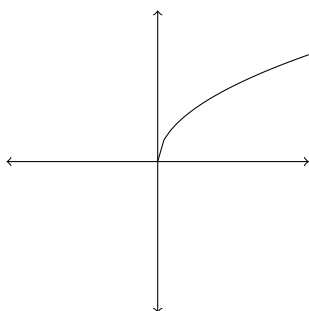
4). (10 points) Identify each of the following standard functions:



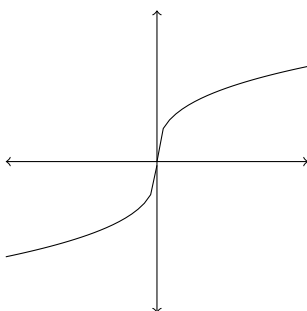
$y =$



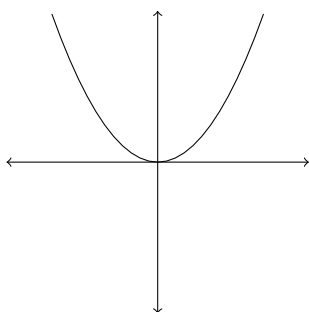
$y =$



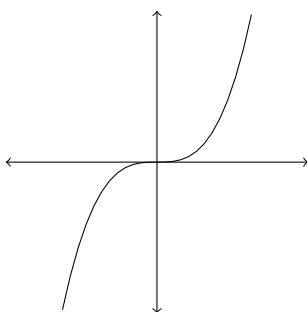
$y =$



$y =$



$y =$



$y =$

5). (20 points) Consider the function:

$$f(x) = -(x - 1)^2 + 4$$

a). Provide a list of transformations, starting from a basic function, for the function in the order that they are applied (i.e., inside-out).

i.

ii.

iii.

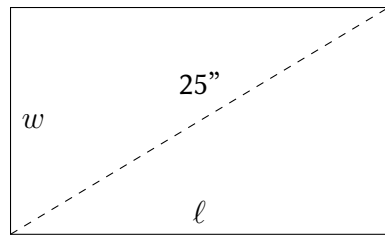
iv.

b). Determine any x-intercepts.

c). Determine any y-intercepts.

d). Sketch the function. Be sure to label all key points!

- 6). (20 points) You are a product manager at an electronics firm in charge of a proposed new line of 25-inch monitors (i.e., the length of the diagonal across the screen is 25 inches):

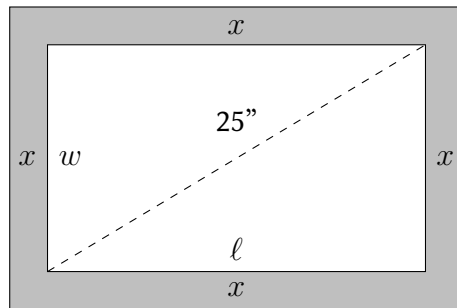


You realize that the most appealing ratio for the dimensions of the screen would follow the golden ratio:

$$\frac{\ell}{w} = \frac{1 + \sqrt{5}}{2} \approx 1.6 = \frac{8}{5}$$

- a). Using the estimate of $8/5$, determine the dimensions ($\ell \times w$) for the new monitor. Round each dimension to two decimal places.

- b). There needs to be an equal amount of casing around the edges of the screen and the packaging department would like the monitor to have a total area of 400 square inches.



Determine the width of the casing (x) around the screen. Round your answer to two decimal places.