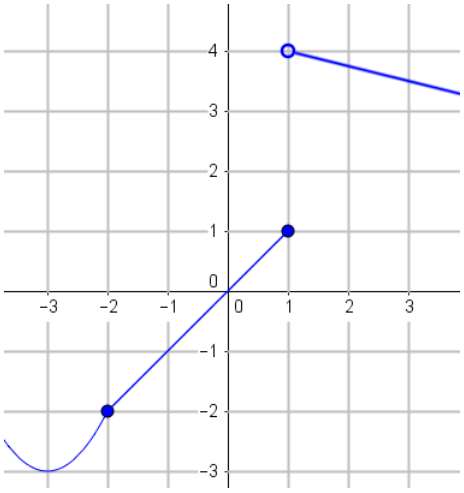
MTH 1000, Exam 1 Name: _____

Time: 75 minutes, Max Points: 100 [+5 Bonus]

Print your name clearly. Show **all work clearly** and in order. Use of books, notes, calculators, or any other resource is **not** permitted. Attach additional pages of work if necessary.

1. [10 points] Consider the graph of a function $f(x)$ below.



   (a) Find the x-intercept(s)

   (b) Find the y-intercept(s).

   (c) Is f a continuous function?

   (d) Find $f(-2)$.

   (e) Find $f(1)$.

2. [15 points] Consider the graph pictured above.

   (a) Find the formula for f.

   (b) Find the domain and range of f.

3. [10 points] By completing the square, find the center and radius for the circle with the equation

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

4. [15 points] Katie shoots an arrow straight upward and its height t seconds after the shot is $s(t) = -t^2 + 10t + 5$ feet.

   (a) How many seconds after the shot will it fall back down to hit her if she doesn't move? (Assuming she is 5 ft tall).

   (b) What is the maximum height the arrow reaches?

5. [10 points] Find the equation of the line (in $y = mx + b$ form) that passes through the point $(-2, 2)$ and is

   (a) perpendicular to the line $4x - 2y = 8$.

   (b) parallel to the line $4x - 2y = 8$.

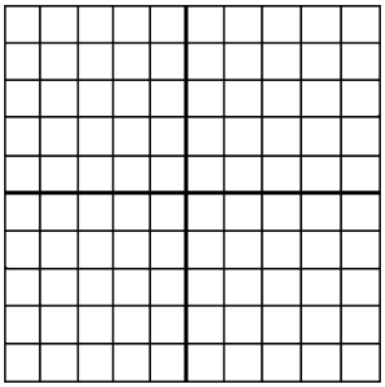
6. [8 points] State the domain for the functions in interval notation.

   (a) $f(x) = \frac{x+5}{x^2-4}$

   (b) $g(x) = \frac{\sqrt{3-x}}{x+6}$

7. [20 points] Consider the piecewise function $f(x) = \begin{cases} -x^2, & \text{if } x < -2 \\ 3, & \text{if } 2 \leq x \leq 2 \\ -x^2, & \text{if } x > 2 \end{cases}$.

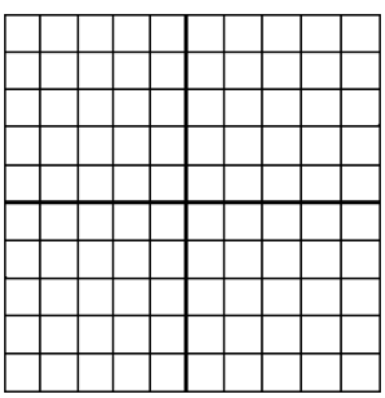
(a) Graph the f.



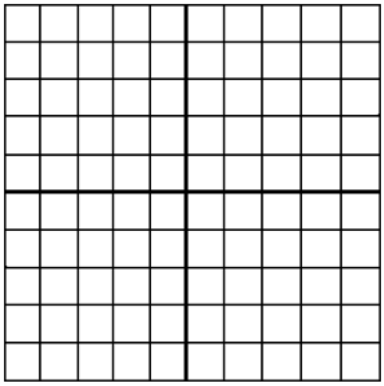
(b) State the domain and range of f.

(c) Does the function have x-axis symmetry, y-axis symmetry, origin symmetry, or none?

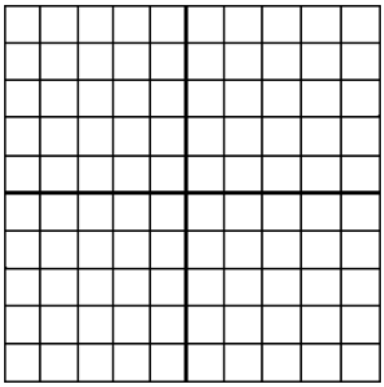
(d) Find the formula and graph of f if it is reflected about the x-axis.

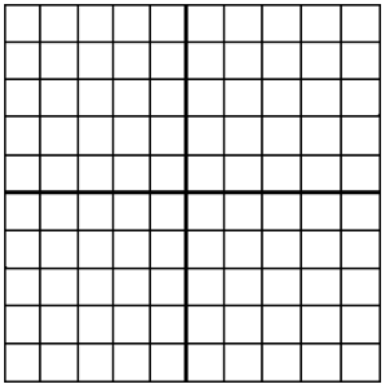


8. [6 points] Plot $\frac{1}{x-2} + 2$.



9. [6 points] Plot $-\sqrt{2x}$



Bonus [+5 points] Find a and b so that the following function is continuous and make a rough sketch of it.

$$f(x) = \begin{cases} 2x^3, & x < -1 \\ ax + 4, & -1 \leq x < 3 \end{cases}$$