University of Georgia	Math 1113	
Department of Mathematics	Test 1	Fall 2023

By providing my signature below I acknowledge that I abide by the University's academic honesty policy. This is my work, and I did not get any help from anyone else during the exam:

Name (sign): _____   Name (print): _____

Student Number: _____

Instructor's Name: _____   Class Time: _____

- If you need extra space use the last page.

- Please show your work. **An unjustified answer may receive little or no credit.**

- If you make use of a theorem to justify a conclusion then state the theorem used by name.

- Your work must be **neat**. If I can't read it (or can't find it), I can't grade it.

- The total number of possible points that is assigned for each problem is shown here. The number of points for each subproblem is shown within the exam.

- Please turn off your mobile phone.

- A calculator is not necessary, but numerical answers should be given in a form that can be directly entered into a calculator.

- Common identities:

$$\cos(\alpha + \beta) = \cos(\alpha)\cos(\beta) - \sin(\alpha)\sin(\beta),$$
$$\sin(\alpha + \beta) = \sin(\alpha)\cos(\beta) + \cos(\alpha)\sin(\beta).$$

Problem Number	Points Possible	Points Made
1	0	
2	20	
3	20	
4	5	
5	20	
6	15	
7	10	
8	10	
Total:	100	

1. [2 Bonus] Common Knowledge: Will Puck Pieterse ride a wheelie across the final line at the Cyclocross World Championship?

2. Determine all of the values of x for each question below that satisfy the given equation. If no values of x satisfy the equation provide a brief justification as to how you arrived at your conclusion.

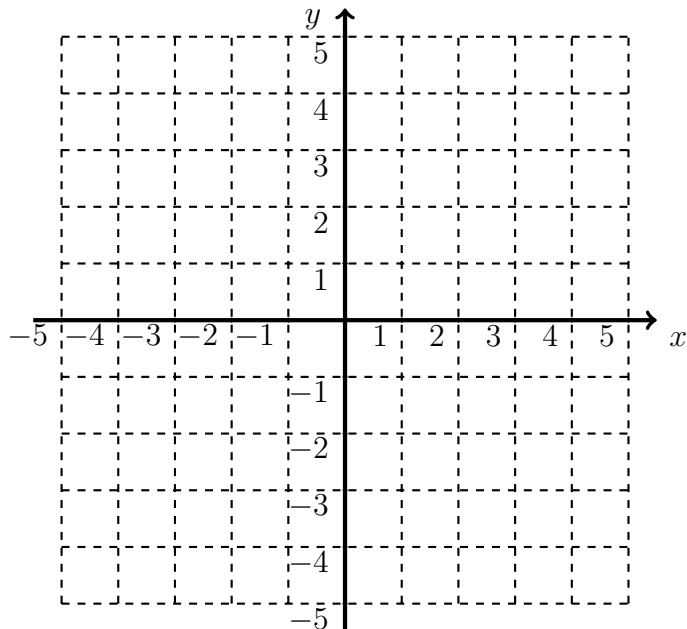(a) [5 pts] $\sqrt{x+2} = 5$.

(b) [5 pts] $\dfrac{1}{x+1} = x + 2$.

(c) [5 pts] $\dfrac{1}{x^2 - 1} = 2$.

(d) [5 pts] $|x + 3| = 1$.

3. Two functions, $l(x)$ and $m(x)$, are given below. Use the functions to answer each of the questions below.

$$f(x) = x^2 \qquad\qquad g(x) = \begin{cases} -x(x+1) & x < 0, \\ x(x-1) & x \geq 0. \end{cases}$$

(a) [5 pts] Use the axes below to make a rough sketch of the function $g(x)$.

(b) [5 pts] Determine the intervals where the function $g(x)$ is increasing.

(c) [5 pts] Determine the domain of the function $\frac{g(x)}{f(x)}$.

(d) [5 pts] Determine the formula for the function $g(f(x))$.

4. [5 pts] Determine an expression for a line whose graph includes the point $(3, 1)$, and the y-value of a point on the line decreases by four when the corresponding x-value increases by five.

5. Define the following functions by

$$q(x) = -(x-2)^2 + 3,$$
$$l(x) = mx + 3.$$

where m and b are real numbers.

(a) [5 pts] Determine the value of m so that the graph of $l(x)$ includes the vertex of $q(x)$.

(b) [5 pts] Determine the average rate of change of $q(x)$ from $x = -3$ to $x = 7$.

(c) [5 pts] Determine the values of x where the function $q(x)$ is increasing. (Express your answer using interval notation.)

(d) [5 pts] Determine the possible values of m so that the graph of the function $l(x)$ does not intersect the graph of the function $q(x)$ for $x > 0$. (Express your answer using interval notation.)

6. A vendor sells delicious fried food at an event. Before the event begins eighty kilograms of fried food is sold. The event lasts sixty minutes, and the vendor sells twenty kilograms per minute during the event. After the event ends the vendor sells seven kilograms per minute and closes thirty minutes after the end.

   (a) [5 pts] Determine a formula for the amount of food (in kilograms) sold given the time after the start of the event. Express your formula as a piecewise defined function.

   (b) [5 pts] At what time after the start of the event has the vendor sold 933 kilograms of fried food?

   (c) [5 pts] What is the total mass of fried food sold by the vendor?

7. [10 pts] The graph of a function, $k(x)$, is shown in the diagram below. Make a rough sketch of the function $k(2x + 1) + 4$ using the empty axes below.

Points earned: _____

out of a possible 0 points
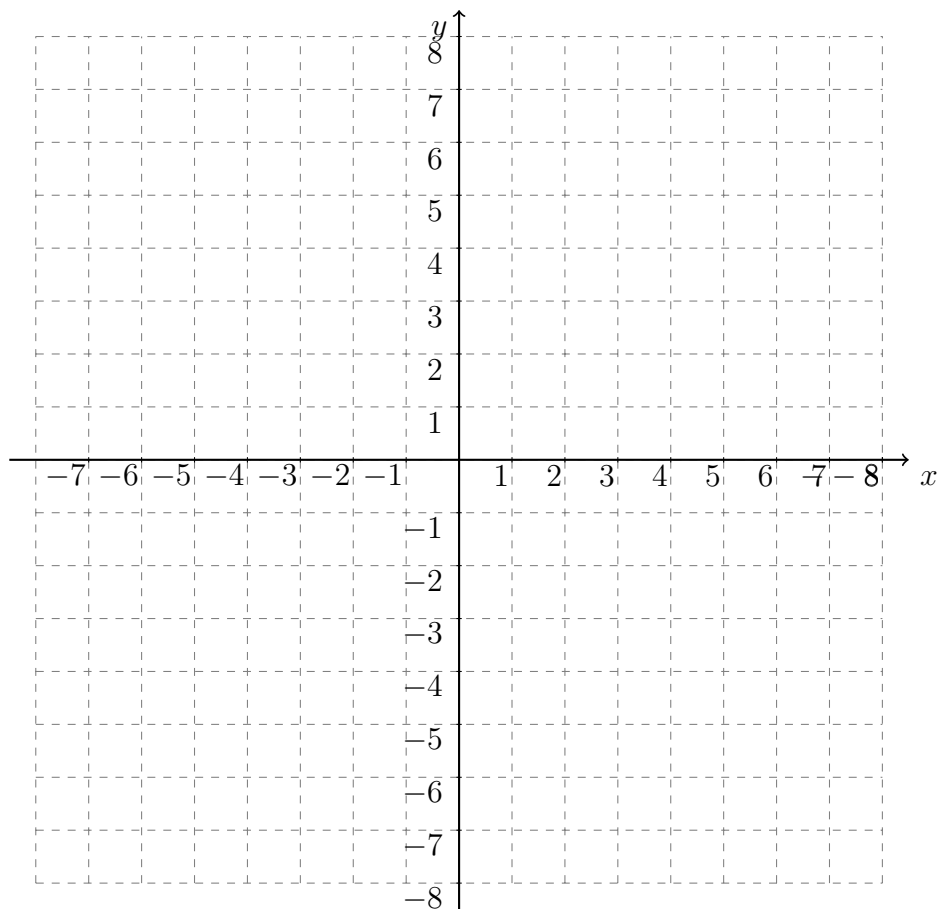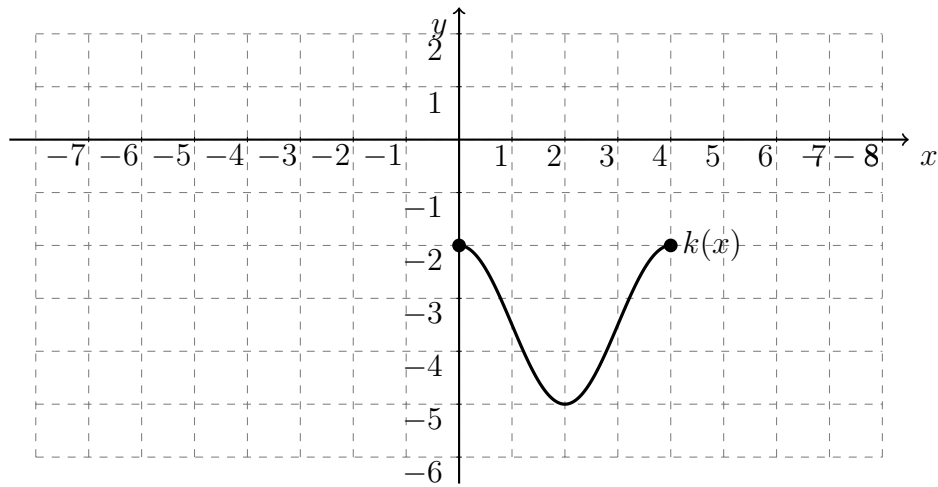
8. [10 pts] A cloth tapestry will be constructed in the shape of a rectangle. The edging that will be used across the top and bottom of the tapestry will cost four dollars per meter. The edging that will be used along the sides will cost five dollars per meter. A total of one hundred dollars will be used for the edging. What dimensions will allow for the largest possible area of the tapestry?

Extra space for work. **Do not detach this page.** If you want us to consider the work on this page you should print your name, instructor and class meeting time below.

Name (print): _____ Instructor (print): _____ Time: _____