University of Georgia   **Math 1113**
Department of Mathematics   **Test 1**   Spring 2019

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	15	
3	10	
4	15	
5	10	
6	15	
7	15	
8	10	
9	10	
Total:	100	

1. [2 Bonus] Common Knowledge: Which team is the defending National Champions in NCAA women's hockey?

2. Determine all of the values of x for each question below that satisfy the given equation.
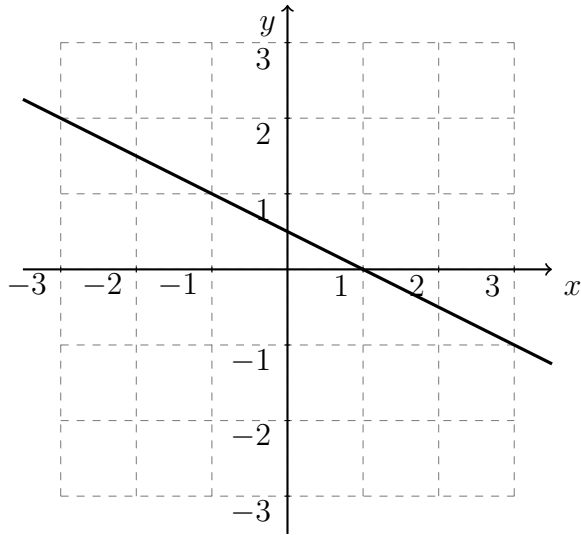
   (a) [5 pts] $8x - 7 = 3x + 1$

   (b) [5 pts] $\sqrt{1 - 4x} = \dfrac{1}{2}$

   (c) [5 pts] $\dfrac{1}{3x + 1} = 4x$

3. Determine a formula for each of the lines described below.

_____ (a) [5 pts] The line whose graph is given in the following plot:

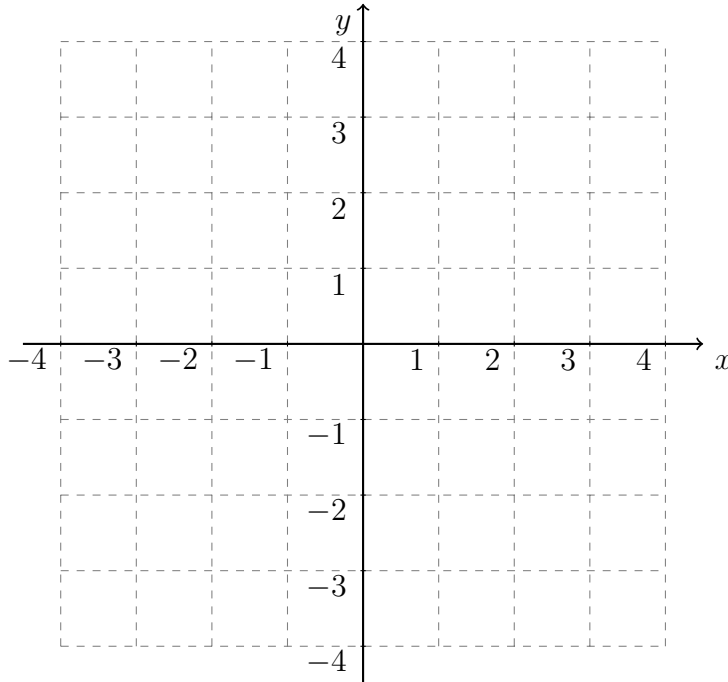(b) [5 pts] The line that is perpendicular to the line given by

$$y + 2 = \frac{1}{3}(x - 4)$$

and goes through the point $(1, -5)$.

4. The questions below refer to the function defined by

$$H(x) \;=\; \begin{cases} -2x - 1 & -2 \;<\; x \;\leq\; 1, \\ x^2 - 4x + 5 & 1 \;<\; x \;<\; 3. \end{cases}$$

(a) [5 pts] Make a sketch of the function using the axes below.

(b) [5 pts] Determine the average rate of change of the function from $x = -1$ to $x = 2$.

(c) [5 pts] Determine the values of x where the function is increasing and also determine the values of x where the function is decreasing.

out of a possible 15 points

5. The equations for two different lines are the following:

$$\text{Line 1}: \ y - 3 \ = \ 4(x - 7),$$
$$\text{Line 2}: \ y - 1 \ = \ m(x + 9).$$

(a) [5 pts] What are the possible values of m that will insure that the two lines intersect?

(b) [5 pts] If you are given that the value of y for line 2 is less than 1 when x is positive what does that imply about whether or not the value of m is positive or negative? (Briefly explain your reasoning.)

6. The questions at the bottom of the page refer to the functions represented below. The graph is for the function $p(x)$, and the table is for the function $w(x)$. **Answer each question, and if an answer does not exist briefly explain why.**
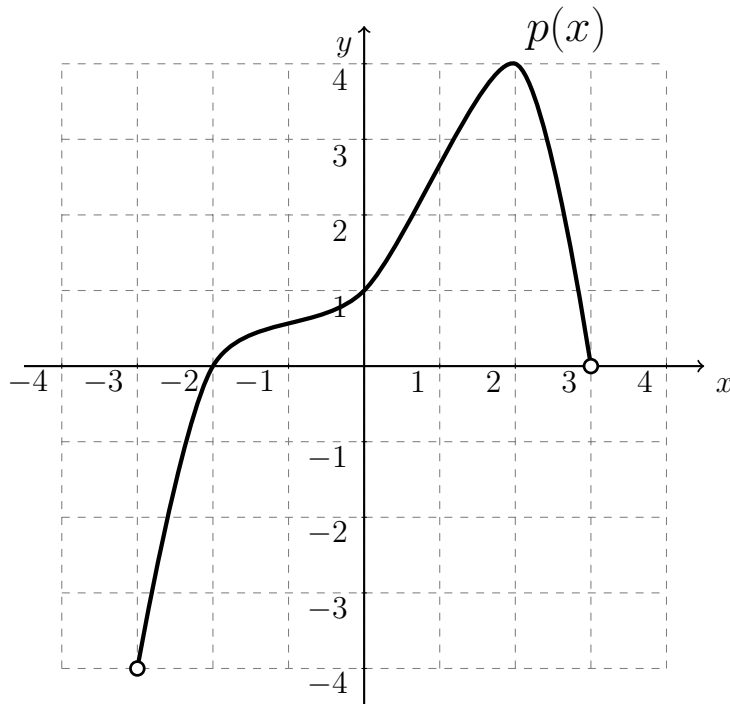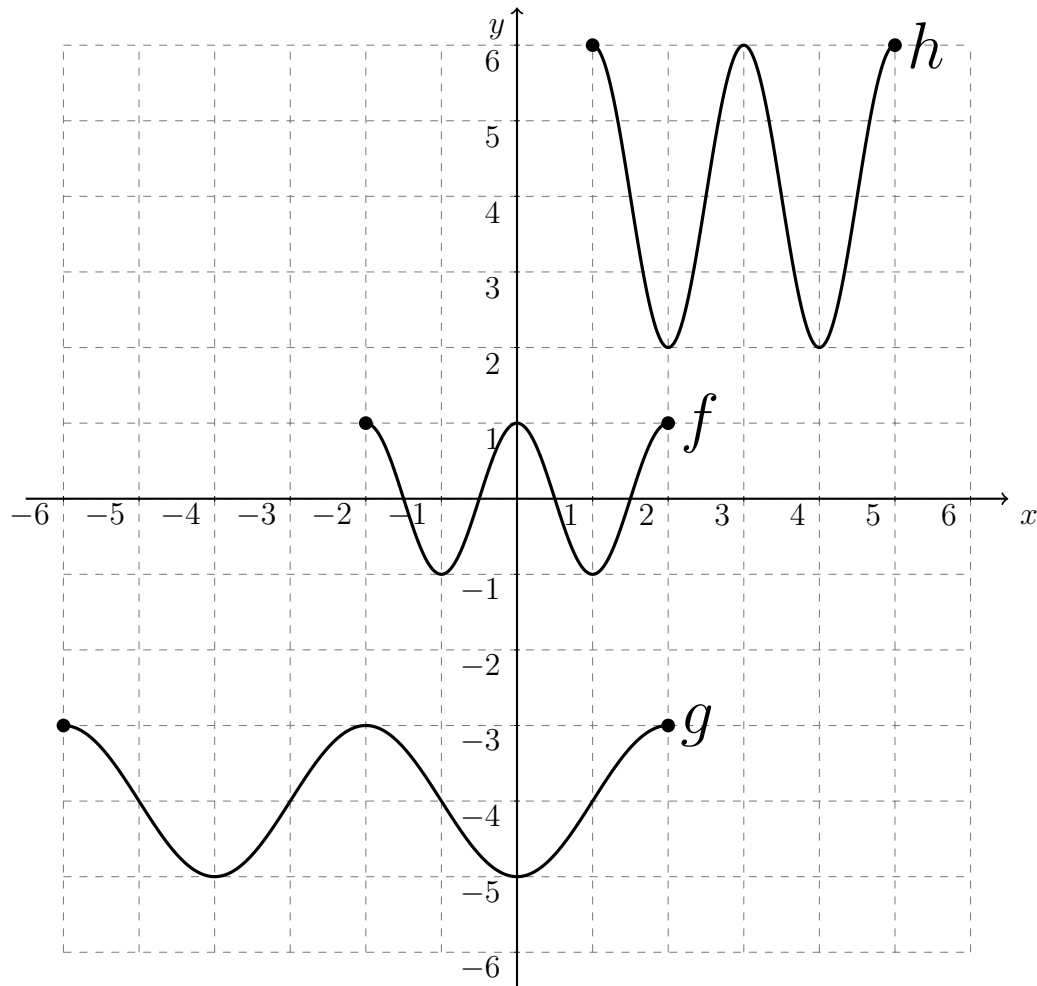

x	w(x)
1	-2
2	3
3	1
4	-1

(a) [5 pts] $w(p(2))$

(b) [5 pts] $p(w(2))$

(c) [5 pts] Determine the domain of $p(w(x))$.

7. The graphs of three functions, f, g, and h, are given in the plot below.

_____ (a) [5 pts] Determine the domain and range of the function, f.

(b) [5 pts] The function h can be written in terms of f as $h(x) = Af(c \cdot x + d) + B$. Determine the values of A, B, c, and d.

_____

(c) [5 pts] The function g can be written in terms of f as $g(x) = Af(c \cdot x + d) + B$. Determine the values of A, B, c, and d.

_____

8. [10 pts] It is determined that the rate of genetic change of the plants in a certain region is a linear function of the species richness of the region. When the richness is measured to be 120 species the genetic change is 500 mutations per year. It is estimated that an increase of 20 species results in an increase of 8 mutations per year. Determine the equation relating the genetic change and the species richness.

9. [10 pts] The owners of a restaurant plan on building a courtyard for their customers. The courtyard will be in the shape of a rectangle. The rectangle will have a concrete walkway around the border, and it will have one straight concrete walkway that will neatly divide the rectangle in half. The walkway will cost 120$ per foot of length, and the owners have allocated 4,000$ total to the project. What dimensions should they use if they wish to maximize the total area of the courtyard. (Ignore the width of the walkways when calculating the area of the courtyard.)

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: _____

Points earned: _____
out of a possible 0 points