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: _____

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

- 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:

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

1. Determine the value of x for each question below that satisfies the given equations.

_____　(a) [5 pts] $\quad \dfrac{4}{7}x - 1 = \dfrac{3}{5}x + 6$

(b) [5 pts] $\quad 7x^2 + x = 4x^2 - x + 1$

_____

(c) [5 pts] $\quad \sqrt{x+3} = x$

Points earned: _____

out of a possible 5 points

2. A line has a slope of 8.

    (a) [5 pts] The line goes through the point $(-5, 9)$. Determine a formula for the line.

    (b) [5 pts] Determine a formula for a different line that is perpendicular to the original line. The new line goes through the point $(2, 6)$.

3. The equation for a circle is given by

$$y^2 + 6y + x^2 - 8x = 11.$$

_____ (a) [5 pts] Determine the center and radius of the circle.

(b) [5 pts] Determine the x-intercepts of the circle. (Determine the exact values.)

_____

4. The questions below refer to the linear functions shown in the plot below. The function $f(x) = m_f x + b_f$ is shown with a solid line, the function $g(x) = m_g x + b_g$ is shown with a dashed line, and the function $h(x) = m_h x + b_h$ is shown with a dotted line.
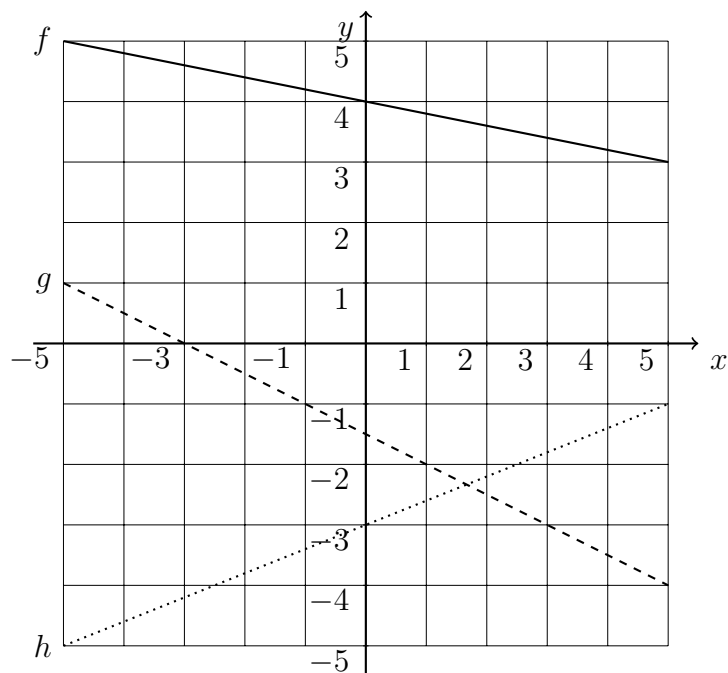
(a) [5 pts] Determine which y-intercept (b_f, b_g, and b_h) is the largest and which is the lowest. (Recall that a negative number is less than a positive number.) Provide a brief justification for your conclusion based on the graph.

(b) [5 pts] Determine which slopes (m_f, m_g, and m_h) is the largest and which is the lowest. Provide a brief justification for your conclusion based on the graph.

(c) [5 pts] Determine which function has the highest x-intercept and which function has the lowest x-intercept. Provide a brief justification for your conclusion based on the graph.

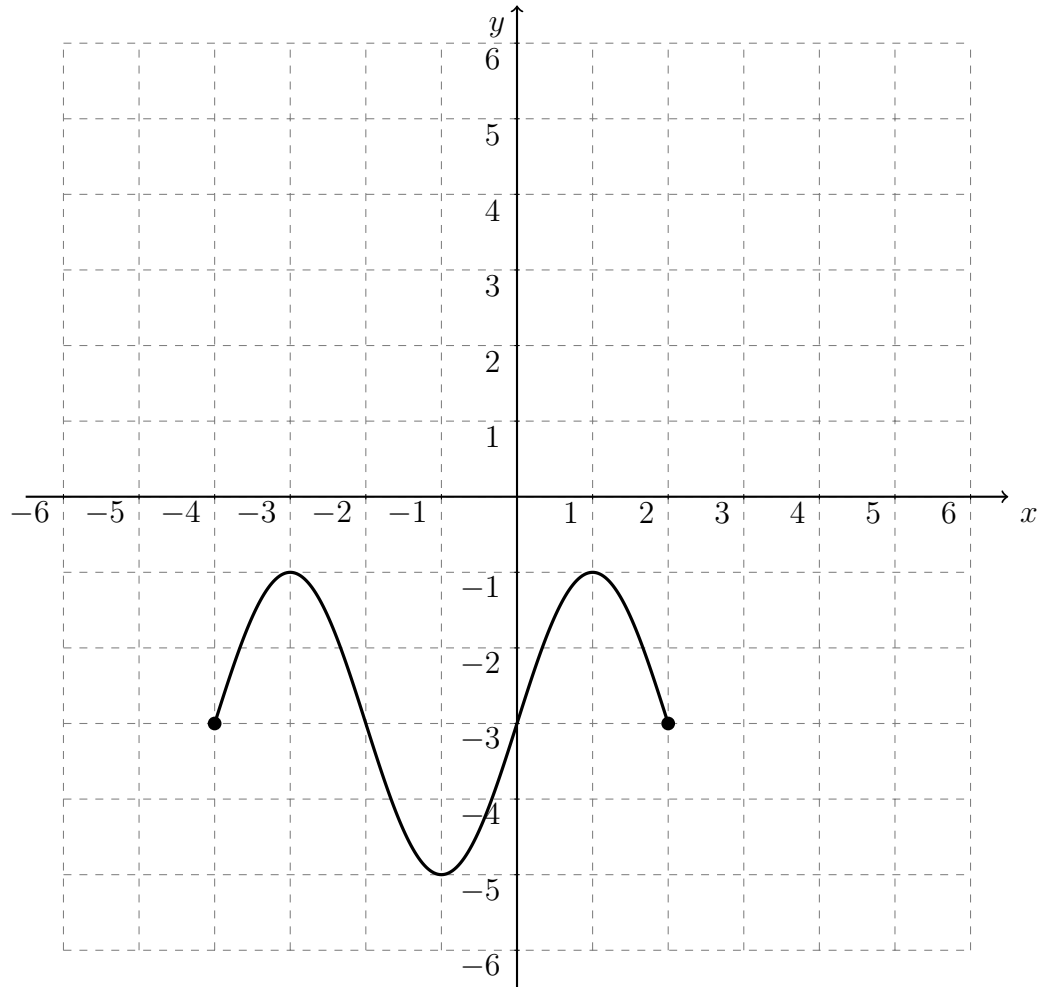5. The graph of a function, q, is shown in the plot below.
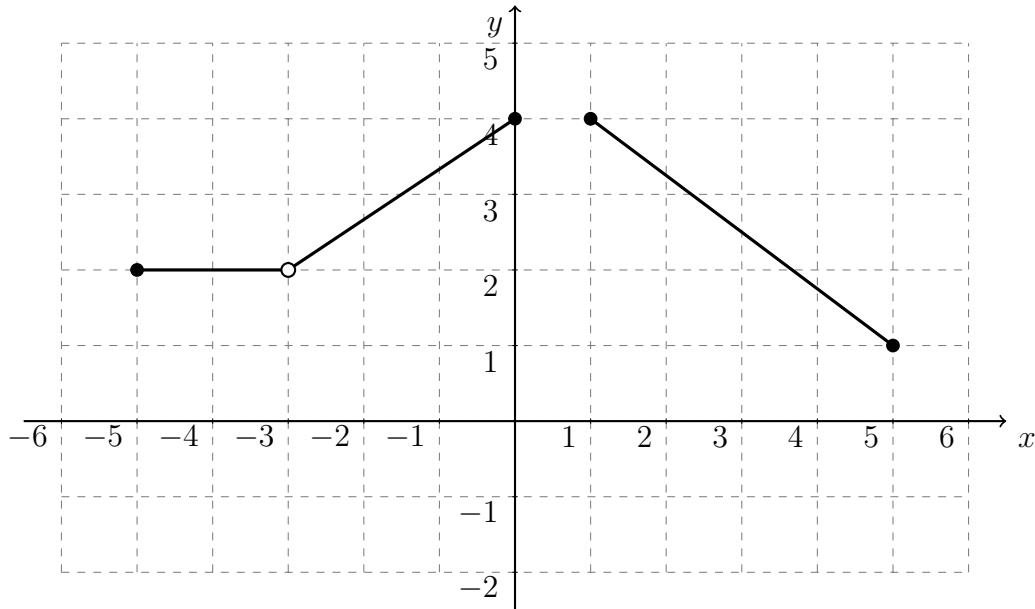
_____ (a) [5 pts] Determine the domain of the function.

(b) [5 pts] Determine the range of the function.

_____

(c) [5 pts] Express the formula for the function using the formal notation for a piecewise defined function.

_____

out of a possible 15 points

6. The graph of a function, f, is given in the plot below.

(a) [5 pts] Add a sketch of the graph of $g(x) = 2f(x-1) + 8$ to the plot above.

(b) [5 pts] Determine the values of x where the function $f(x)$ has a local maximum.

(c) [5 pts] Determine the values of x where the function $h(x) = f(x+4)$ is increasing.

7. [10 pts] The Racine express is moving straight North out of Chicago, and the Davenport Traveler is moving straight West out of Chicago. At a given point in time the distance between the trains is four-hundred and fifty miles. If the Racine express is ninety miles North of Chicago determine the coordinates of the other train. (Treat Chicago as the origin.)

8. [10 pts] A driver will drive a total distance of one hundred miles using two different cars. The driver will drive x miles in the first car and then y miles in the second car. The driver will go in a straight line without doubling back. The cost for driving the first car is x^2, and the cost for driving the second car is $3 \cdot y^2$. Determine the values of x and y that will minimize the total cost.

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: _____