Name: _____

- **READ THE FOLLOWING DIRECTIONS!**
- **Do NOT open the exam until instructed to do so.**
- You have until 12:45pm to complete this exam. When you are told to stop writing, do it or you will lose all points on the page(s) you write on.
- You may not communicate with other students during this test.
- Keep your eyes on your own paper.
- No written materials of any kind are allowed. No scratch paper is allowed except as given by the proctor.
- No phones, calculators, or any other electronic devices are allowed for any reason, including checking the time (a simple wristwatch is fine).
- Any case of cheating will be taken extremely seriously.
- Show all your work and explain your answers when appropriate.
- Before turning in your exam, check to make certain you've answered all the questions.

Question	Points	Score
1	9	
2	6	
3	12	
4	15	
5	5	
6	6	
7	10	
8	10	
9	0	
10	6	
11	9	
12	10	
13	16	
14	8	
15	14	
Total:	136	

1. (9 points) Complete the following table.

inequality	interval	graph
$x > -2$		
	$(-\infty, 5]$	
		

2. (6 points) Solve the inequality $1 < 3-2x \leq 7$. Write your answer in each of the following forms: **1.** a simplified inequality, **2.** interval notation, **3.** a graph on the real line.

3. (12 points) Solve the following inequalities. Give your answers in each of the following forms: **1.** a simplified inequality, **2.** interval notation.

   (a) $4x + 3 \leq 4x + 5$

   (b) $4x + 3 \leq 3x + 5$

   (c) $3x + 5 \leq 3x + 4$

4. (15 points) Find all solutions to the following equations using the indicated method.

   (a) $x^2 - x - 6 = 0$ by factoring

   (b) $2x^2 - 8x - 3 = 0$ by completing the square

   (c) $x^2 + 3x - 5 = 0$ using the quadratic formula

5. (5 points) Find all solutions to $x^3 + 2x^2 + x = 0$.

6. (6 points) Use the discriminant to find the number of solutions to each of the following. (You do not have to find those solutions.)

   (a) $x^2 + 2x - 5 = 0$

   (b) $x^2 - 2x + 5 = 0$

   (c) $x^2 + 6x + 9 = 0$

7. (10 points) For the equation $y = 4|x + 1| - 2$, find (and clearly label) the x- and y-intercepts, plot at least five points, then sketch the plot.

8. (10 points) Use the distance formula to test whether the points $(1, 3)$, $(-2, 1)$, and $(4, -2)$ form the vertices of a right triangle.

9. Bonus: check the same thing using what you know about slopes of lines. Make sure you say how you know whether the triangle is a right triangle.

10. (6 points) Find the midpoint of the line segment joining $(-3, 1)$ to $(4, -5)$.

11. Consider the line $y = 5 - \frac{2}{3}x$.

    (a) (5 points) Identify the slope, and use this to graph the line.

    (b) (4 points) Find the equation of a line that is perpendicular to the given line and passes through the point $(-2, 1)$.

12. (10 points) Suppose the population of yeast in a petri dish at noon is 1.8 billion, and at 2pm is 4.6 billion. Let y denote the population of yeast in billions and x denote the number of hours past noon. (Assume that the population growth of the yeast is linear.)

(a) Write the information above as two points (x, y).

(b) Find the equation of a line containing those two points.

(c) Identify and interpret the slope of this linear equation (in the context of the original problem).

13. (16 points) Find equations for each of the following lines.

(a) with y-intercept $(0, -1)$ and slope -3

(b) with x-intercept $(4, 0)$ and slope $\frac{1}{2}$

(c) parallel to the line $x - 2y = 7$ and passing through $(1, 3)$

(d) that is vertical and passes through $(3, 5)$

14. (8 points) Which of the following are functions?
    (a) Assign to each person in this class their height.
    (b) Assign to each height (as a whole number of inches) the person in the world with that height.
    (c) $f(x) = \pm x^2$
    (d) $f(x) = \sqrt{x}$

15. (14 points) Let $g(x) = 4x - x^2$. Find and simplify the following.
    (a) $g(-5)$

    (b) $-g(5)$

    (c) $g(2x)$

    (d) $2g(x)$

    (e) $g(x + h)$

    (f) $g(x) + g(h)$

    (g) $\dfrac{g(x + h) - g(x)}{h}$

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