

**Math 129 - Final Exam A**  
December 11, 2019

Name \_\_\_\_\_  
Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations where necessary. Label your axes when graphing.

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1. (4 points [11]) Solve for  $r$ :  $-2|3r - 7| = -12$

2. (6 points [3]) Solve for  $y$ . Write your solution set in interval notation, and graph it on a number line.

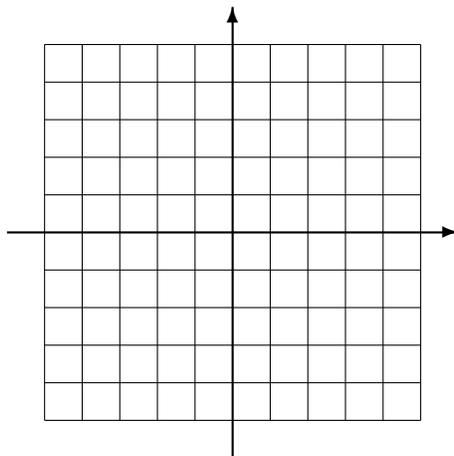
$$2(y + 2) - 3 < y + 7 \quad \text{and} \quad 7 - 2y \leq 1$$

3. (5 points [7]) Solve for  $x$ . Write your answer(s) in decimal form, rounded to the nearest hundredth.

$$4x^2 - 4x - 1 = 0$$

4. (4 points [3,11]) Solve for  $x$ :  $\frac{3}{x} = \frac{4}{2x+1}$

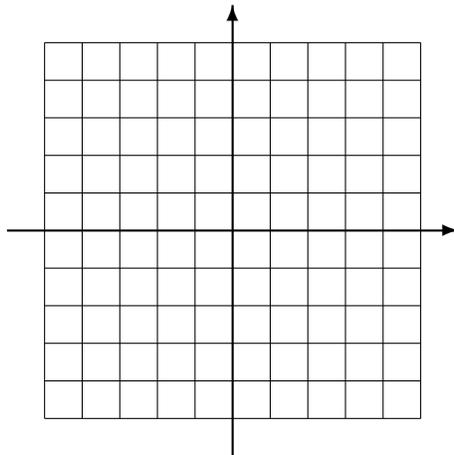
5. (6 points [3]) A line is described by the equation  $-\frac{5}{4}x + 2y = 5$ . Find the  $x$ - and  $y$ -intercepts of the line. Then plot your intercepts and sketch the line.



6. (5 points [2,4]) The line  $L$  passes through the point  $(-4, -2)$  and is perpendicular to the line given by  $y = -2x + 1$ . Find an equation for the line  $L$ . Write your final answer in standard form ( $Ax + By = C$ ).

7. (3 points [1]) Determine the domain of the function  $f(x) = \frac{2x}{(2x+1)(x-7)}$ .

8. (4 points [2,4]) Determine the slope and  $y$ -intercept of the line described by  $3x - y = -4$ . Then graph the line.

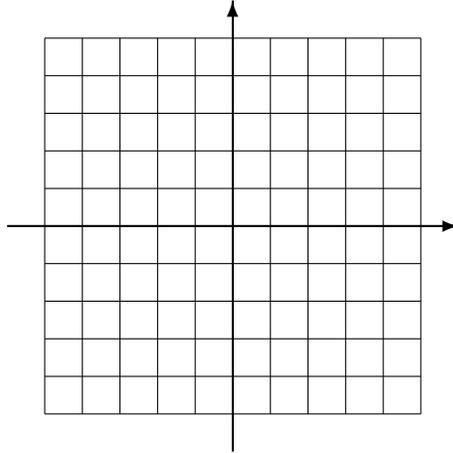


9. (4 points [2,3,4]) A street vendor will sell 200 ice cream cones if she sells them for \$2 each, and she will sell 120 cones if she sells them for \$3 each. Determine the linear equation that describes how the demand varies with cost. Say what your variables represent.
10. (6 points [5]) Let  $g(x) = x^2 + 2x$ . Expand and simplify the difference quotient  $\frac{g(x+h) - g(x)}{h}$ .

11. (7 points [8,9,10]) Let  $f(x) = 2|x + 1| - 3$ .

(a) Explain how the graph of  $f$  can be obtained from the graph of  $y = |x|$ .

(b) Carefully sketch the graph of  $f$ .



(c) Determine the domain and range of  $f$ .

12. (6 points [5]) Let  $f(x) = 3 + \sqrt{x}$  and  $g(x) = \begin{cases} x^2 + 4, & \text{if } x < -2 \\ 3x + 7, & \text{if } x > 0 \end{cases}$ .

(a) Compute  $g(-1)$ .

(b) Compute  $g(-10)$ .

(c) Compute  $(g \circ f)(4)$ .

(d) If  $h(x) = x^2 + 1$ , then what function is  $(h \circ f)(x)$ ? Completely expand and simplify your answer.

13. (12 points [11,12,13]) Consider the polynomial  $f(x) = -2x(x - 2)^3(x + 1)^2$ .

(a) Determine the degree of  $f$ .

(b) State the zeros of  $f$  and their corresponding multiplicities.

(c) Describe the end behavior of the graph of  $f$ .

(d) Determine the  $y$ -intercept.

(e) Roughly sketch the graph of  $f$ . Be sure that your graph correctly illustrates the  $y$ -intercept, the end behavior, and the behavior at the  $x$ -intercepts.

(f) Use your graph to solve  $f(x) > 0$ . Write your solution in interval notation.

14. (4 points [8]) The graph of  $f(x) = (x + 3)^2 - 5$  is a parabola.

(a) Explain how the graph of  $f$  can be obtained from the graph of  $y = x^2$ .

(b) Determine the vertex and an equation for the axis of symmetry of the graph of  $f$ .

15. (8 points [13]) Let  $f(x) = \frac{x^3 + 5x^2 + 7}{x^2 - 2x}$ . Determine the slant asymptote and the vertical asymptotes of the graph of  $f$ .

16. (4 points [13]) Let  $R(x) = \frac{2x^3 + x^2}{x(x - 3)(x + 7)}$ .

(a) Determine any horizontal asymptotes of the graph of  $R$ .

(b) Explain why  $x = 0$  is NOT a vertical asymptote of the graph of  $R$ .

17. (4 points [12]) Use synthetic division and the remainder theorem to evaluate  $f(2)$  if  $f(x) = 2x^2 + 3x + 1$ .

18. (8 points [11,12,13]) Solve the inequality and write your solution in interval notation. Show all work.

$$\frac{(x+2)^2}{(x-4)(x+5)} \geq 0$$