

Math 109 - Final Exam A
December 12, 2019

Name _____
Score _____

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

1. (4 points [3]) Solve for w : $-3(w + 5) + 5w = 3w + 10 - (w + 15)$

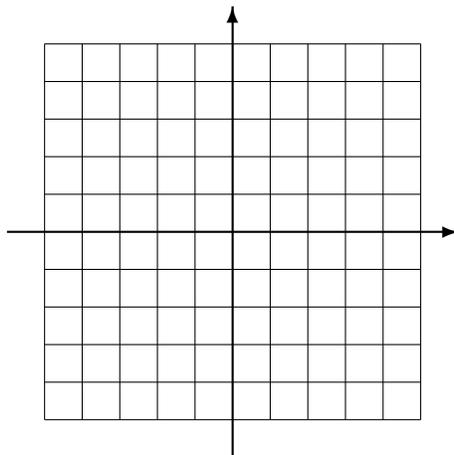
2. (6 points [3]) Solve for y . Write your solution set in interval notation, and graph it on a number line.

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

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. (6 points [2]) 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.

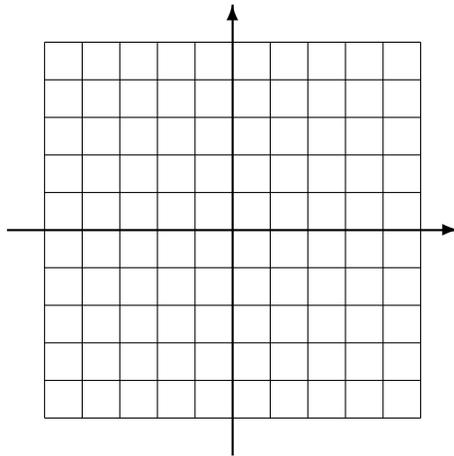


5. (6 points [6]) Let $g(x) = x^2 + x$. Expand and simplify the difference quotient $\frac{g(x+h) - g(x)}{h}$.

6. (3 points [1]) Determine the domain of the function $f(x) = \frac{2x}{(2x+1)(x-7)}$.

7. (5 points [2]) 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 ($Ax + By = C$).

8. (5 points [2]) Determine the slope and y -intercept of the line described by $3x - y = -4$. Then graph the line.



9. (4 points [9]) Use synthetic division and the remainder theorem to evaluate $f(2)$ if $f(x) = 2x^2 + 3x + 1$.

10. (4 points [6,8]) 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 .
11. (12 points [9,10]) 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.

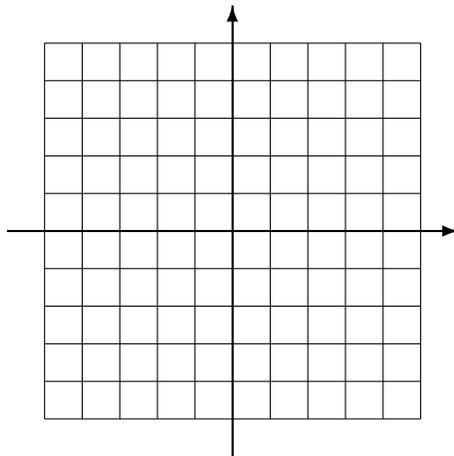
 - (c) Describe the end behavior of the graph of f .

 - (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.

12. (5 points [12]) Determine four points on the graph of $g(x) = \left(\frac{1}{2}\right)^x$. Then plot your points and carefully sketch the graph. Indicate any asymptotes.



13. (2 points [12]) Rewrite as an exponential equation: $\log_3\left(\frac{1}{9}\right) = -2$

14. (4 points [12]) Explain how the graph of $f(x) = 3 + \ln(x - 4)$ can be obtained from the graph of $y = \ln x$. Then find an equation for the vertical asymptote of the graph of f .

15. (3 points [9]) Use properties of logarithms to completely expand: $\log\left(\frac{x^3}{y^2}\right)$

16. (3 points [9]) Use the change-of-base formula to write $\log_7 91$ in terms of natural logarithms. Then use your calculator to compute the value. Round to the nearest hundredth.

17. (3 points [9]) Solve for x : $2^{4x+1} = 32$

18. (5 points [13]) When she took her new job, Marie received a \$15,000 cash bonus. She deposited the money into an IRA that earns 8.5% compounded annually. How long must she wait for her account to reach \$100,000? (The compound interest formula is $A = P(1 + \frac{r}{n})^{nt}$.)

19. (8 points [14]) One month Jina rented 6 movies and 4 video games for a total of \$30. The next month she rented 3 movies and 6 video games for a total of \$33. Set up the system of linear equations described by the problem situation. Then solve your system to determine the cost of each movie and video game rental.

20. (7 points [14]) Solve the system by graphing each equation.

$$4x + 3y = 12$$

$$y = \frac{2}{3}x - 2$$

