

MATH 107 FINAL EXAMINATION

This is an open-book exam. You may refer to your text and other course materials as you work on the exam, and you may use a calculator. **You must complete the exam individually.** Neither collaboration nor consultation with others is allowed.

Record your answers and work on the separate answer sheet provided.

There are 30 problems.

Problems #1–12 are Multiple Choice.

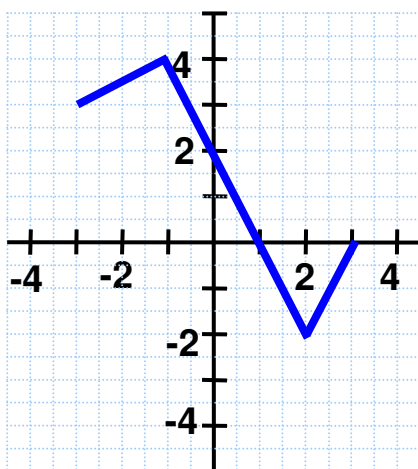
Problems #13–21 are Short Answer. (Work not required to be shown)

Problems #22–30 are Short Answer with work required to be shown.

MULTIPLE CHOICE

1. Determine the domain and range of the piecewise function.

1. _____



- A. Domain $[-3, 3]$; Range $[-2, 4]$
- B. Domain $[-3, 3]$; Range $[0, 3]$
- C. Domain $[-2, 4]$; Range $[-3, 3]$
- D. Domain $[-1, 4]$; Range $[-2, 2]$

2. Solve: $\sqrt{x+17} = 3-x$

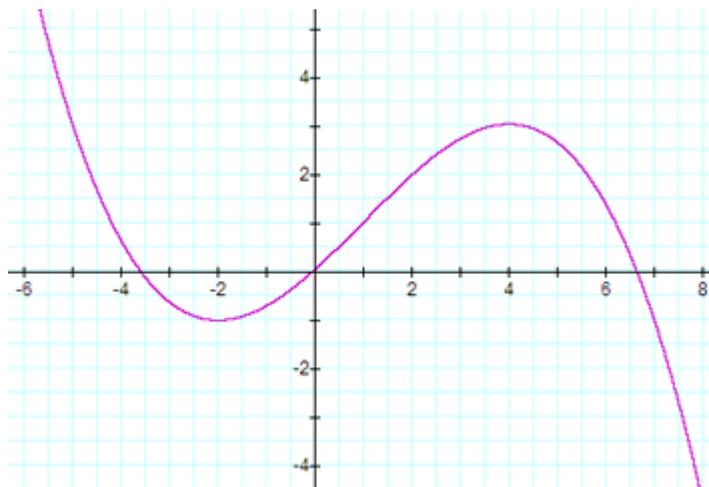
2. _____

- A. -7
- B. $-1, 8$
- C. -1
- D. No solution

3. Determine the interval(s) on which the function is increasing.

3. _____

- A. $(-\infty, -3.6)$ and $(0, 6.7)$
- B. $(-\infty, -2)$ and $(4, \infty)$
- C. $(-1, 3)$
- D. $(-2, 4)$



4. Determine whether the graph of $y = 7 - |x|$ is symmetric with respect to the origin, the x -axis, or the y -axis.

4. _____

- A. not symmetric with respect to the x -axis, not symmetric with respect to the y -axis, and not symmetric with respect to the origin
- B. symmetric with respect to the x -axis only
- C. symmetric with respect to the y -axis only
- D. symmetric with respect to the origin only

5. Solve, and express the answer in interval notation: $|6 - 5x| \leq 4$.

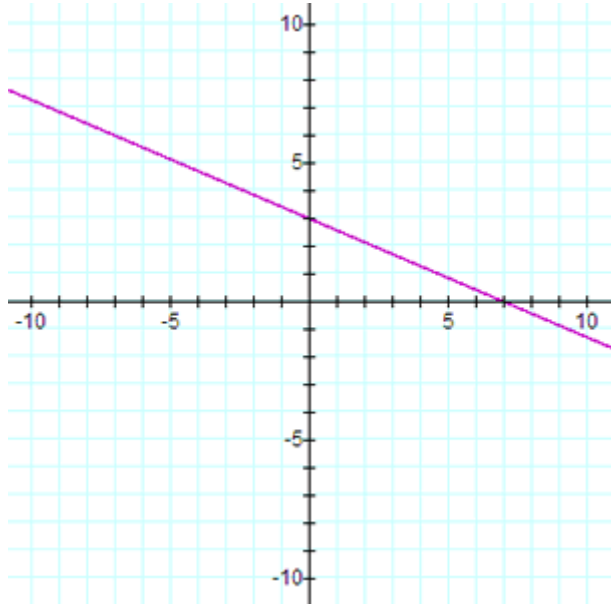
5. _____

- A. $[2/5, 2]$
- B. $(-\infty, 2/5]$
- C. $(-\infty, 2] \cup [2/5, \infty)$
- D. $(-\infty, 2/5] \cup [2, \infty)$

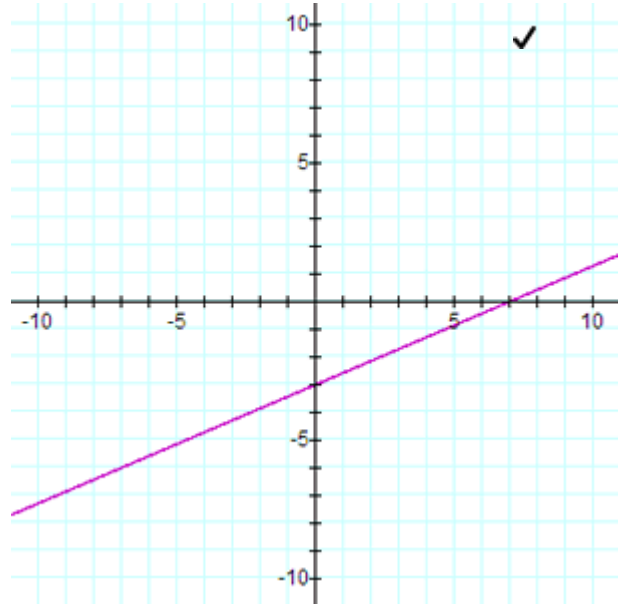
6. Which of the following represents the graph of $3x - 7y = 21$?

6. _____

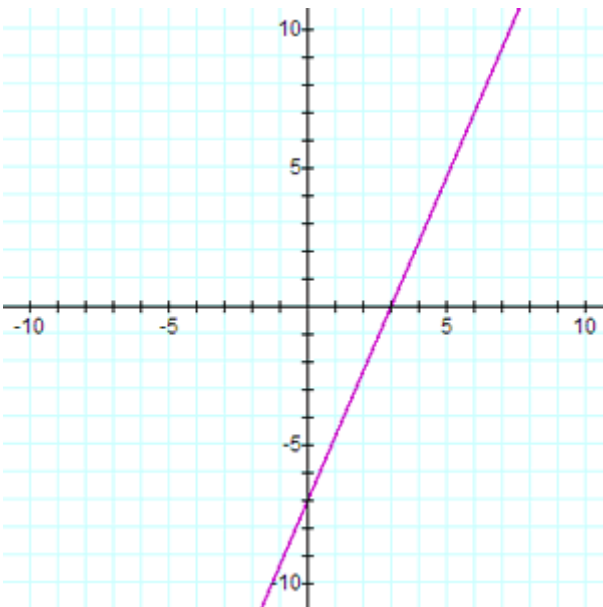
A.



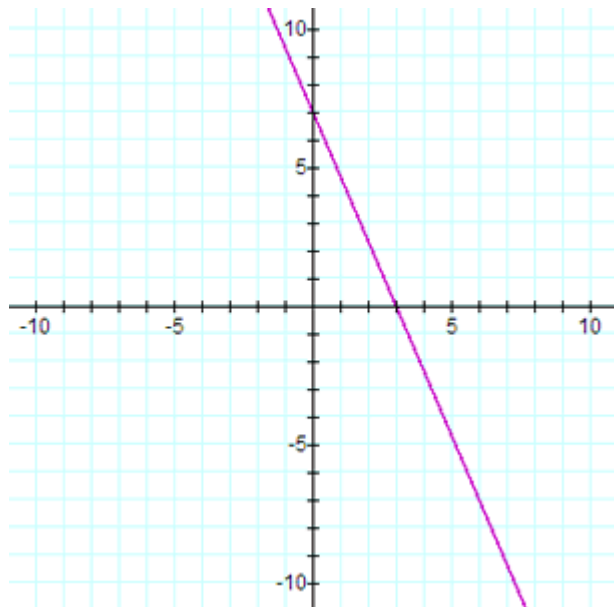
B.



C.



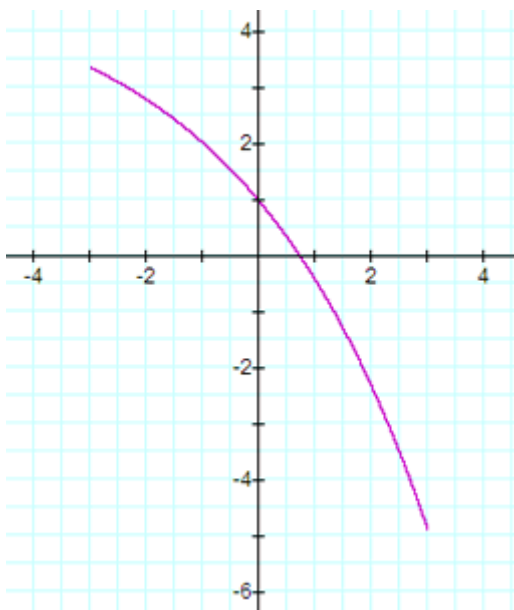
D.



7. Write a slope-intercept equation for a line parallel to the line $x - 5y = 9$ which passes through the point $(-10, 7)$. 7. _____

- A. $y = \frac{1}{5}x + 7$
- B. $y = \frac{1}{5}x + 9$
- C. $y = -\frac{1}{5}x + 5$
- D. $y = 5x + 57$

8. Does the graph below represent a function and is it one-to-one? 8. _____



- A. It is a function and it is one-to-one.
- B. It is a function but not one-to-one.
- C. It is not a function but it is one-to-one.
- D. It is not a function and it is not one-to-one.

9. Express as an equivalent expression: $3 \log (x+4) - 2 \log y + \log 1$

9. _____

A. $\frac{12 \log (x)}{\log (2 y)}$

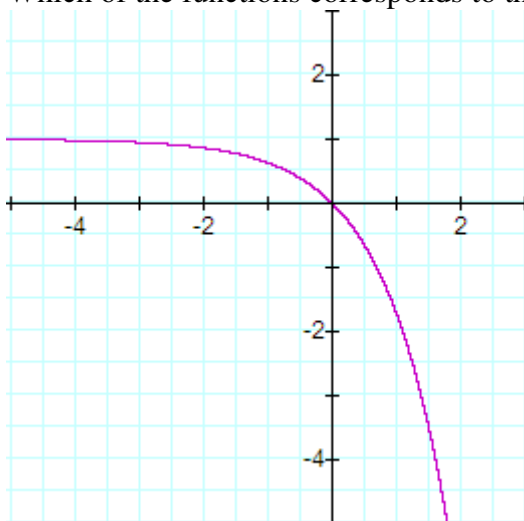
B. $\log \left(\frac{x^3 + 64}{y^2} \right)$

C. $\log \left(\frac{(x+4)^3}{y^2} \right)$

D. $\log (3 x+13-2 y)$

10. Which of the functions corresponds to the graph?

10. _____



A. $f(x) = 1 - e^x$

B. $f(x) = 2 - e^x$

C. $f(x) = -e^x$

D. $f(x) = e^{-x} - 1$

11. Suppose that for a function f , the equation $f(x) = 0$ has exactly one real-number solution.

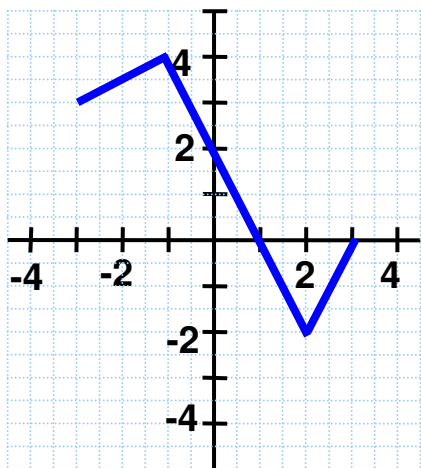
Which of the following statements MUST be true?

11. _____

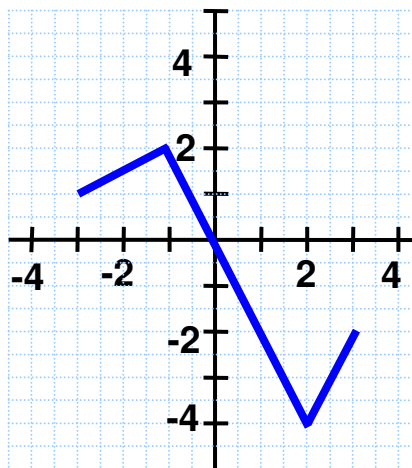
- A. f is a linear function.
- B. $f(x) \geq 0$ for all x in the domain of f .
- C. f has exactly one real-number zero.
- D. f is an invertible function.

12. The graph of $y = f(x)$ is shown at the left and the graph of $y = g(x)$ is shown at the right. (No formulas are given.) What is the relationship between $g(x)$ and $f(x)$?

12. _____



$y = f(x)$



$y = g(x)$

- A. $g(x) = f(x - 2)$
- B. $g(x) = f(x + 2)$
- C. $g(x) = f(x - 4)$
- D. $g(x) = f(x) - 2$

SHORT ANSWER:

13. Multiply and simplify: $(6 - i)(1 - 4i)$.

Write the answer in the form $a + bi$, where a and b are real numbers.

Answer: _____

14. Solve, and write the answer in interval notation: $\frac{x+4}{x-1} \leq 0$.

Answer: _____

15. A can of soda at 78° F. is placed in a refrigerator that maintains a constant temperature of 40° F. The temperature T of the soda t minutes after it is placed in the refrigerator is given by

$$T(t) = 40 + 38 e^{-0.058 t}$$

Find the temperature of the soda 25 minutes after it is placed in the refrigerator. (Round to the nearest degree.)

Answer: _____

16. Find the value of the logarithm: $\log_7 \left(\frac{1}{49} \right)$.

Answer: _____

17. Solve: $3^{6x+7} = 9$.

Answer: _____

18. Suppose \$3,700 is invested in an account at an annual interest rate of 4.6% compounded continuously. How long (to the nearest tenth of a year) will it take the investment to double in size?

Answer: _____

19. Let $f(x) = x^2 + 12x + 28$.

(a) Find the vertex.

Answer: _____

(b) State the range of the function.

Answer: _____

(c) On what interval is the function increasing?

Answer: _____

20. Consider the polynomial $P(x)$, shown in both standard form and factored form.

$$P(x) = \frac{1}{5}x^4 - \frac{3}{5}x^3 - 3x^2 + \frac{19}{5}x + 6 = \frac{1}{5}(x+3)(x+1)(x-2)(x-5)$$

(a) Which sketch illustrates the end behavior of the polynomial function?



Answer: _____

(b) State the y-intercept.

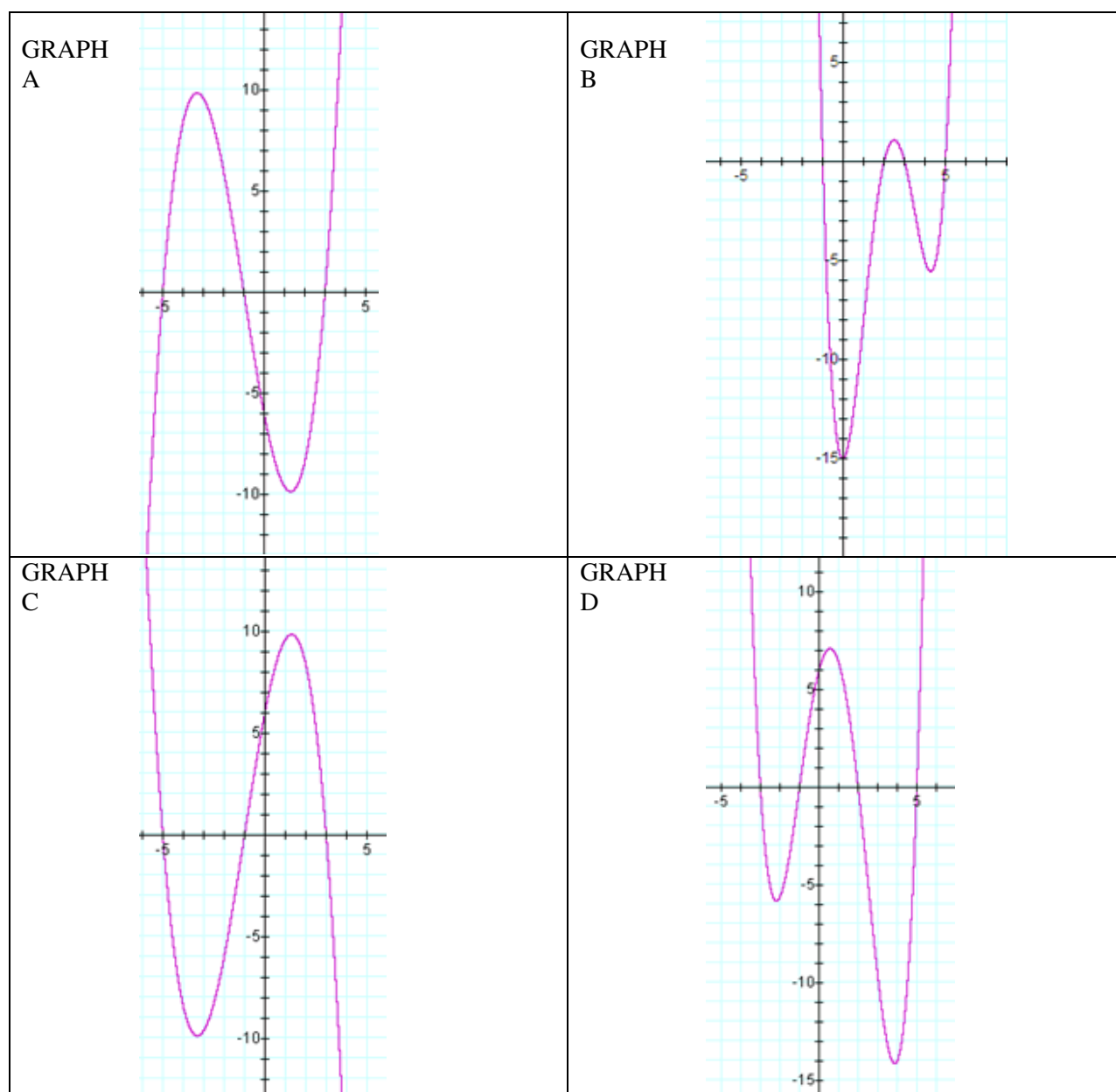
Answer: _____

(c) State the zeros of the function.

Answer: _____

(d) State which graph below is the graph of $P(x)$.

Answer: _____



21. Let $f(x) = \frac{2+x}{3-x}$.

(a) State the domain.

Answer: _____

(b) State the vertical asymptote(s).

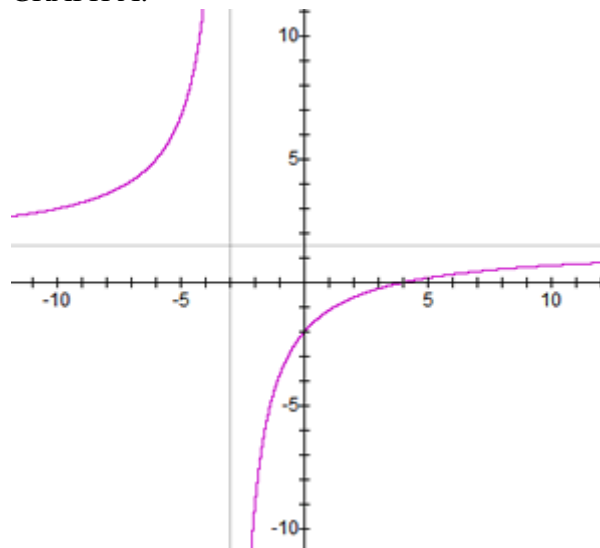
Answer: _____

(c) State the horizontal asymptote.

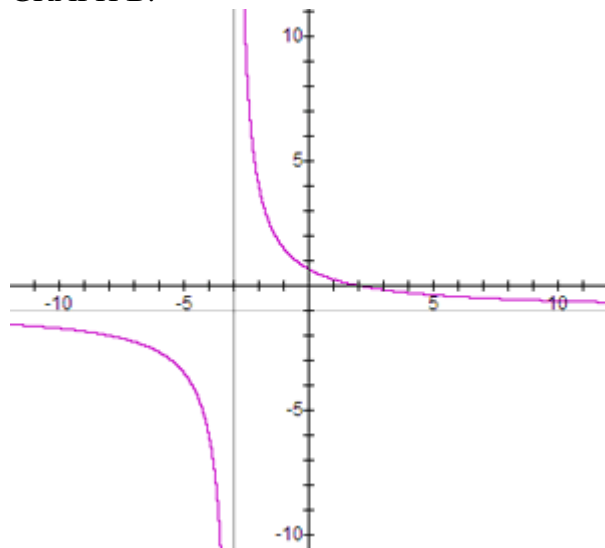
Answer: _____

(d) Which of the following represents the graph of $f(x) = \frac{2+x}{3-x}$? Answer: _____

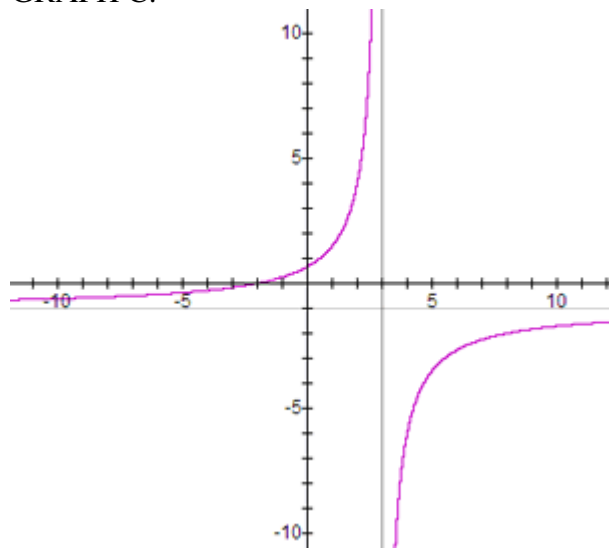
GRAPH A.



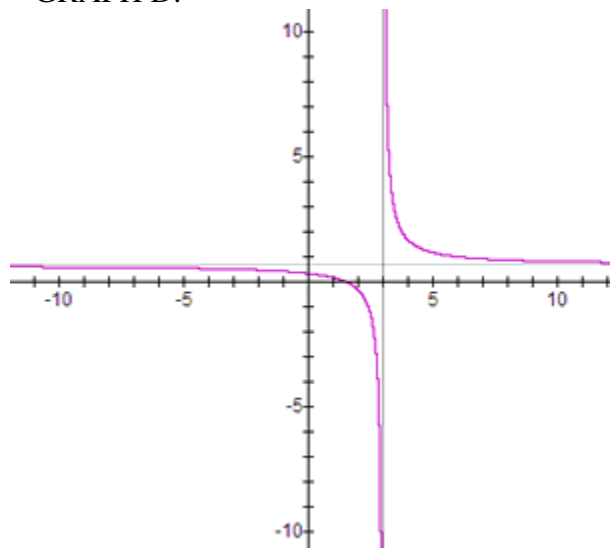
GRAPH B.



GRAPH C.



GRAPH D.



SHORT ANSWER, with work required to be shown, as indicated.

22. Let $f(x) = x - 2$ and $g(x) = \sqrt{x + 5}$.

(a) Find $\left(\frac{f}{g}\right)(-1)$. **Show work.**

(b) Find the domain of the quotient function $\frac{f}{g}$. **Explain.**

23. Points $(-8, 2)$ and $(-2, 6)$ are endpoints of the diameter of a circle.

(a) What is the length of the diameter? Give the exact answer, simplified as much as possible.

Show work.

(b) What is the center point C of the circle?

(c) Given the point C you found in part (b), state the point symmetric to C about the x -axis.

24. Find the equation for a line which passes through the points $(7, 3)$ and $(9, -5)$. Write the equation in slope-intercept form. **Show work.**

25. A salesperson earns a base salary of \$1,540 per month and a commission of 7.6% on the amount of sales made. If the salesperson has a paycheck of \$4,367.20 for one month, what was the amount of sales for the month? **Show work.**

26. Let $f(x) = 2x^2 + 7$ and $g(x) = x - 5$.

(a) Find the composite function $(f \circ g)(x)$ and simplify. **Show work.**

(b) Find $(f \circ g)(1)$. **Show work.**

27. Find the exact solutions and simplify as much as possible: $8x^2 = 3 + 8x$. **Show work.**

28. Given the function $f(x) = \frac{1}{3}x - 2$, find a formula for the inverse function. **Show work.**

29. Donut Delights, Inc. has determined that when x donuts are made daily, the profit P , in dollars, is given by

$$P(x) = -0.002x^2 + 4.1x - 1400$$

(a) What is the company's profit if 600 donuts are made daily?

(b) How many donuts should be made daily in order to maximize the company's profit? **Show work.**

30. Solve: $\frac{x-9}{x-6} + \frac{36}{x^2-36} = 0$. **Show work.**
