

**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.

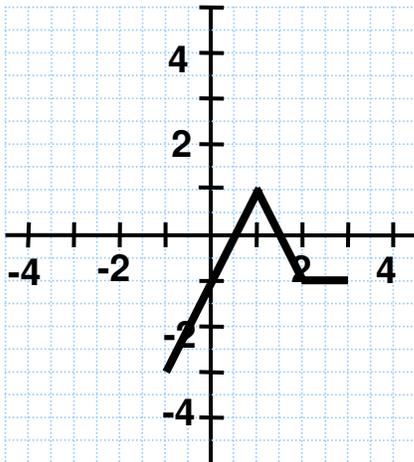
Problems #13–21 are Short Answer. (Work not required to be shown)

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

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

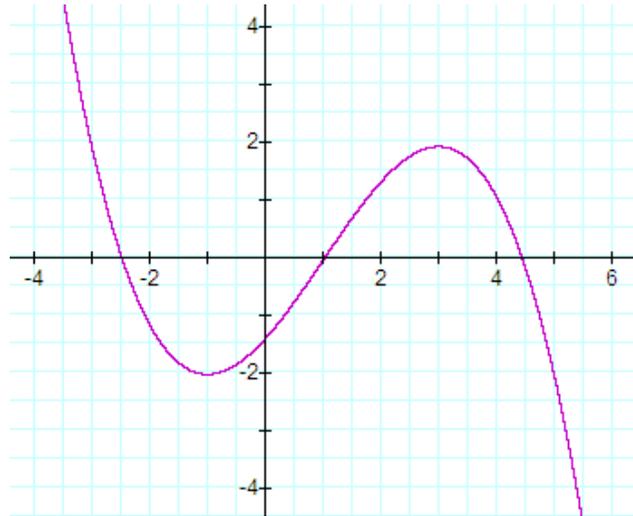
2. \_\_\_\_\_

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

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

3. \_\_\_\_\_

- A.  $(-\infty, 3)$
- B.  $(-2, 2)$
- C.  $(-1, 3)$
- D.  $(-\infty, -2.5)$  and  $(1, 4.5)$



4. Determine whether the graph of  $y = |x - 7|$  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:  $|8 - 7x| \leq 6$ .

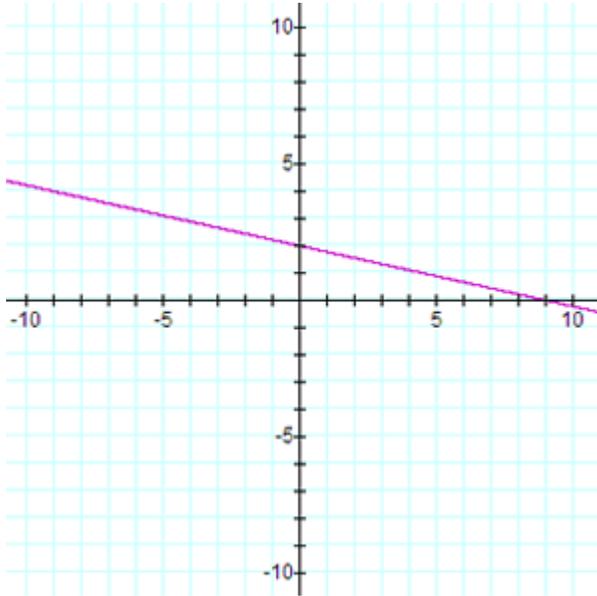
5. \_\_\_\_\_

- A.  $(-\infty, 2/7]$
- B.  $[2/7, 2]$
- C.  $(-\infty, 2] \cup [2/7, \infty)$
- D.  $(-\infty, 2/7] \cup [2, \infty)$

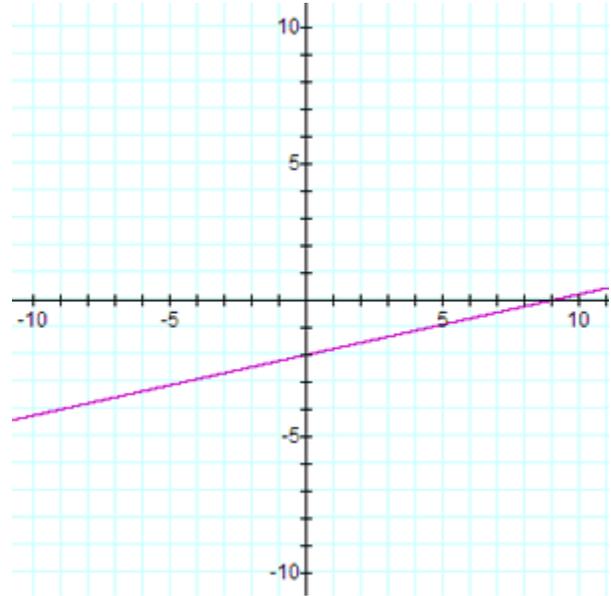
6. Which of the following represents the graph of  $2x + 9y = 18$  ?

6. \_\_\_\_\_

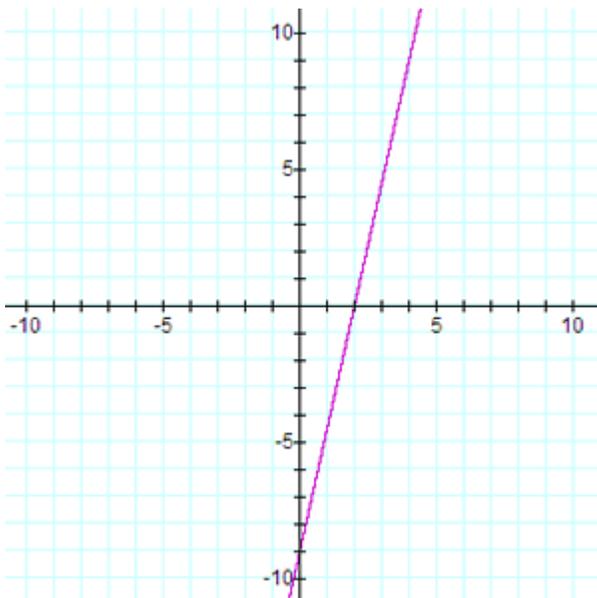
A.



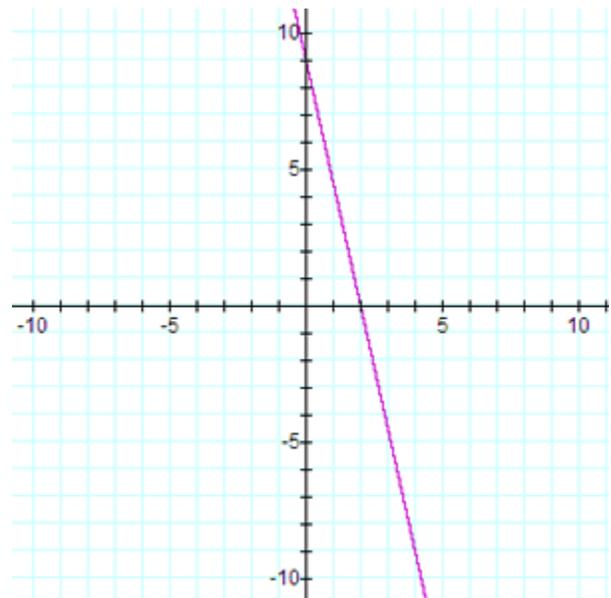
B.



C.



D.



7. Write a slope-intercept equation for a line parallel to the line  $x - 8y = 16$  which passes through the point  $(24, -1)$ . 7. \_\_\_\_\_

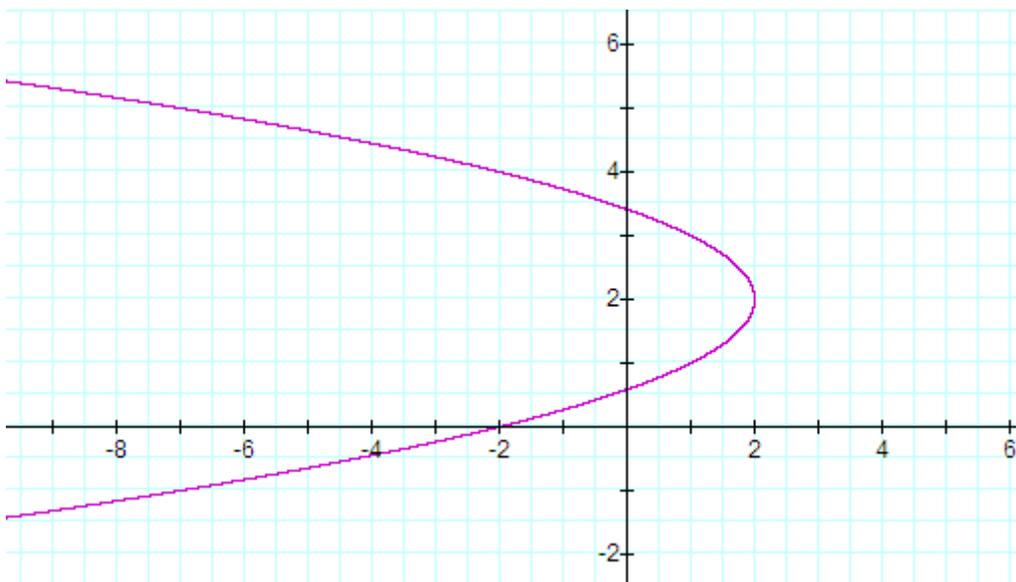
A.  $y = \frac{1}{8}x - 4$

B.  $y = \frac{1}{8}x - 1$

C.  $y = -\frac{1}{8}x - 2$

D.  $y = -2x + 47$

8. Which of the following best describes the graph? 8. \_\_\_\_\_



- A. It is the graph of an absolute value relation.
- B. It is not the graph of a function .
- C. It is the graph of a function and it is one-to-one.
- D. It is the graph of a function but not one-to-one.

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

9. \_\_\_\_\_

A.  $\frac{\log x^9}{\log (y + 3)}$

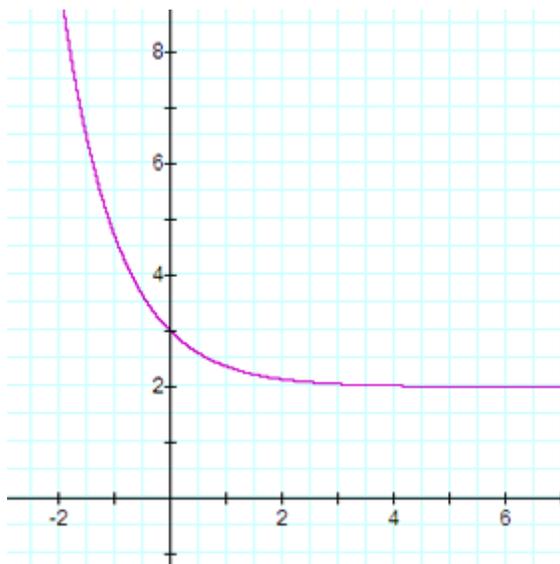
B.  $\log \left( \frac{9x + 1}{y + 3} \right)$

C.  $\log \left( \frac{x^9}{y + 3} \right)$

D.  $\log (9x - y - 2)$

10. Which of the functions corresponds to the graph?

10. \_\_\_\_\_



A.  $f(x) = e^x + 3$

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

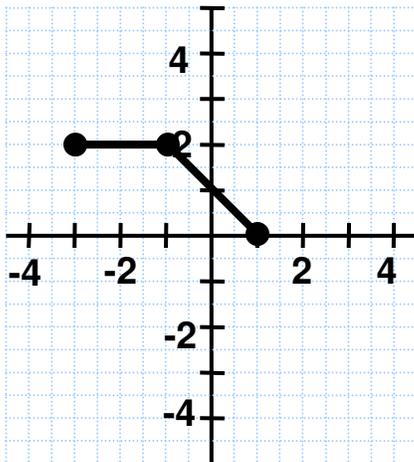
C.  $f(x) = e^{-x} + 3$

D.  $f(x) = -e^x + 3$

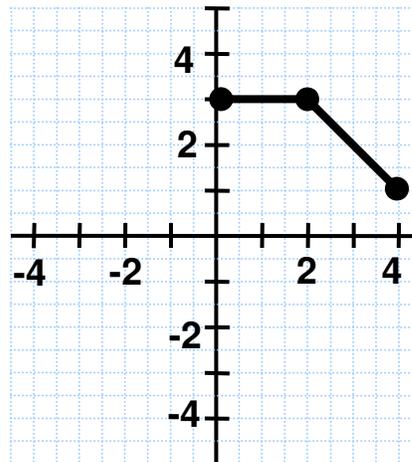
11. The percentage score on a test varies directly as the number of correct responses. Paul answered 48 questions correctly and earned a score of 60%. What would Paul's percentage score have been if he had answered 76 questions correctly? 11. \_\_\_\_\_

- A. 61%
- B. 63%
- C. 88%
- D. 95%

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.  $g(x) = f(x - 1) + 3$
- B.  $g(x) = f(x + 1) - 3$
- C.  $g(x) = f(x + 3) - 1$
- D.  $g(x) = f(x - 3) + 1$

**SHORT ANSWER:**13. Multiply and simplify:  $(8 + 5i)(2 + 3i)$ .Write the answer in the form  $a + bi$ , where  $a$  and  $b$  are real numbers. Answer: \_\_\_\_\_

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14. Solve, and write the answer in interval notation:  $\frac{x+6}{x-8} \geq 0$ . Answer: \_\_\_\_\_

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15. A can of soda at  $90^\circ$  F. is placed in a refrigerator that maintains a constant temperature of  $36^\circ$  F. The temperature  $T$  of the soda  $t$  minutes after it is placed in the refrigerator is given by

$$T(t) = 36 + 54 e^{-0.058 t}$$

Find the temperature of the soda 12 minutes after it is placed in the refrigerator. (Round to the nearest degree.)

Answer: \_\_\_\_\_

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16. Find the value of the logarithm:  $\log_3\left(\frac{1}{81}\right)$ . Answer: \_\_\_\_\_

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17. Solve:  $4^{4x+7} = 16$ . Answer: \_\_\_\_\_

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18. Suppose \$9,000 is invested in an account at an annual interest rate of 2.5% compounded continuously. How long (to the nearest tenth of a year) will it take the investment to double in size? Answer: \_\_\_\_\_

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19. Let  $f(x) = x^2 + 12x + 41$ .

(a) Find the vertex. Answer: \_\_\_\_\_

(b) State the range of the function. Answer: \_\_\_\_\_

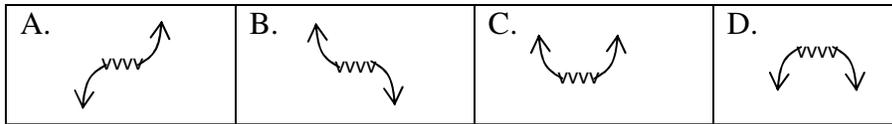
(c) On what interval is the function decreasing? Answer: \_\_\_\_\_

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

$$P(x) = -\frac{1}{3}x^4 - \frac{1}{3}x^3 + \frac{7}{3}x^2 + \frac{1}{3}x - 2 = -\frac{1}{3}(x+3)(x+1)(x-1)(x-2)$$

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



Answer: \_\_\_\_\_

(b) State the y-intercept.

Answer: \_\_\_\_\_

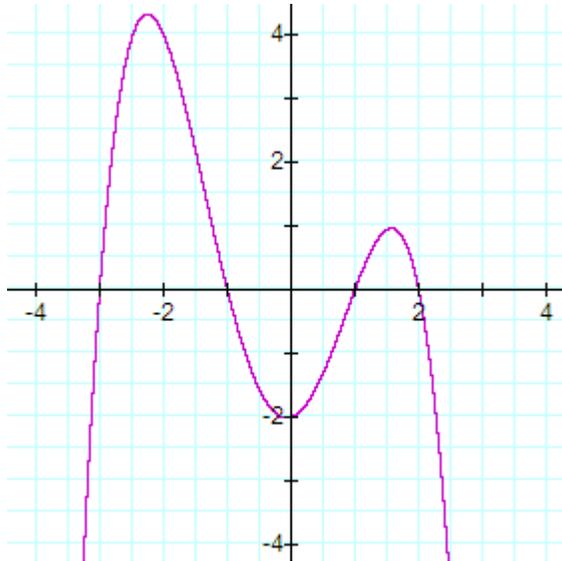
(c) State the zeros of the function.

Answer: \_\_\_\_\_

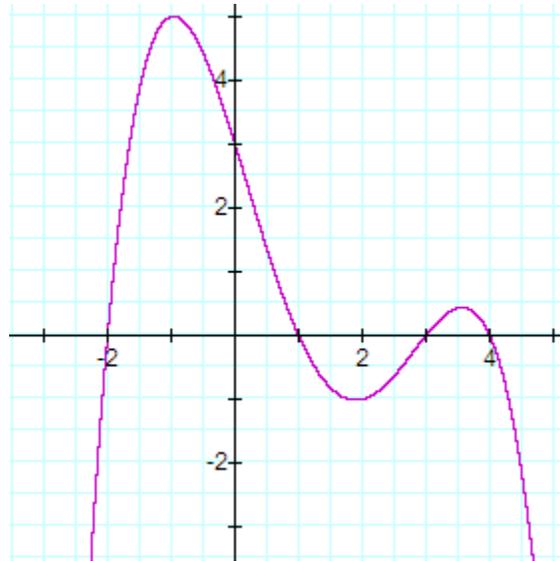
(d) State which graph below is the graph of  $P(x)$ .

Answer: \_\_\_\_\_

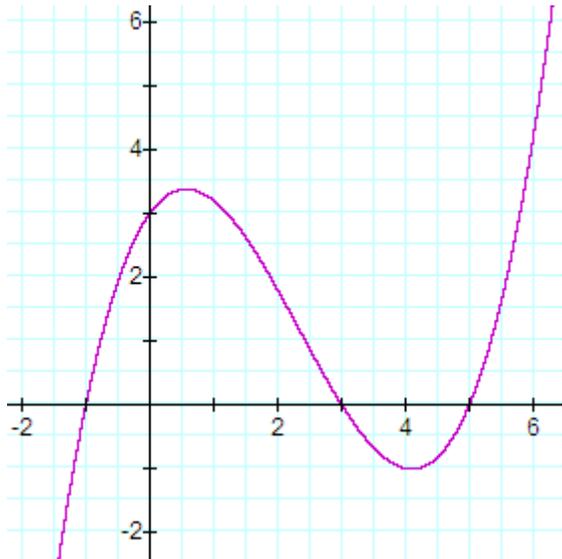
GRAPH A



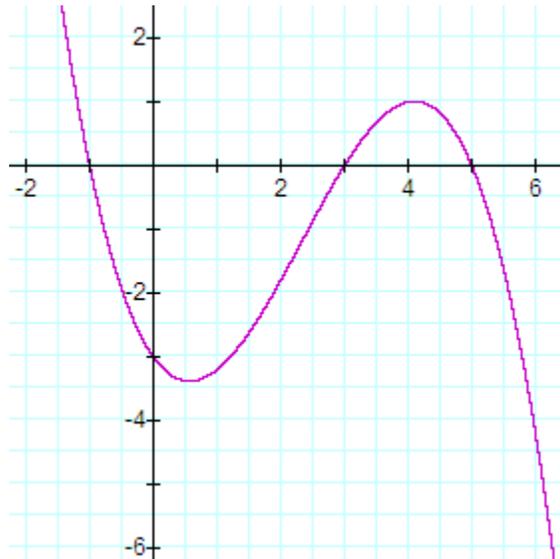
GRAPH B



GRAPH C



GRAPH D



21. Let  $f(x) = \frac{2x-4}{x-3}$ .

(a) State the domain.

Answer: \_\_\_\_\_

(b) State the vertical asymptote(s).

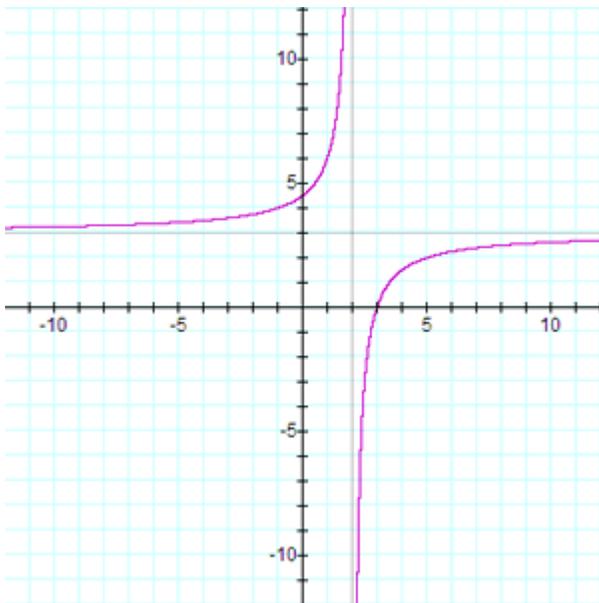
Answer: \_\_\_\_\_

(c) State the horizontal asymptote.

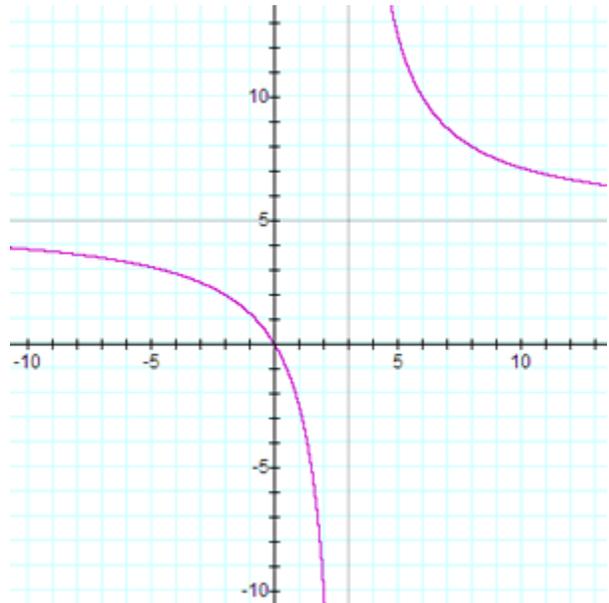
Answer: \_\_\_\_\_

(d) Which of the following represents the graph of  $f(x) = \frac{2x-4}{x-3}$ ? Answer: \_\_\_\_\_

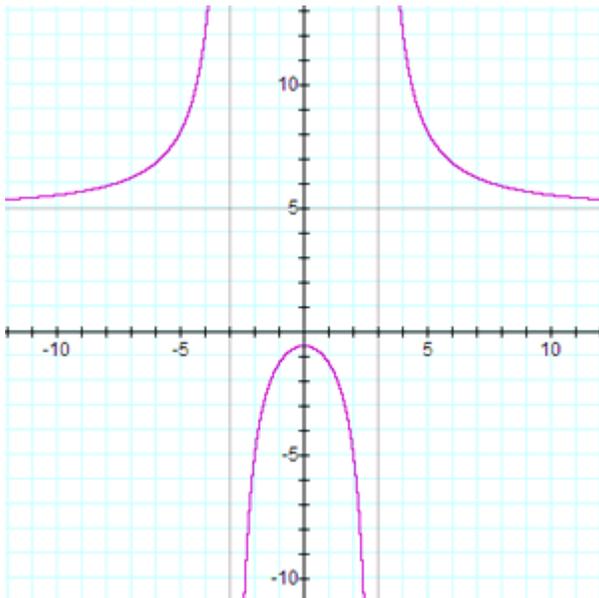
GRAPH A.



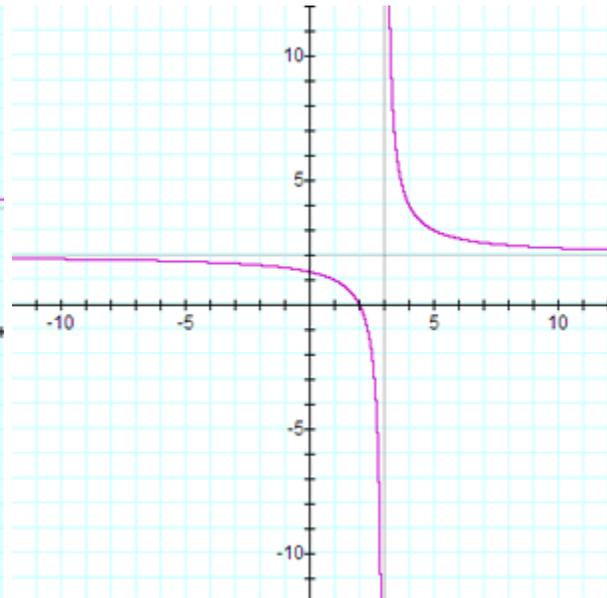
GRAPH B.



GRAPH C.



GRAPH D.



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

22. Simplify:  $\frac{(-2a^6b^5)^3 a^7 b^{-8}}{a^4}$ . **Show work.**

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23. Points  $(5, -2)$  and  $(9, -8)$  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 of the circle?

(c) What is the equation of the circle?

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24. Find the equation for a line which passes through the points  $(7, 8)$  and  $(9, -2)$ . Write the equation in slope-intercept form. **Show work.**

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25. A salesperson earns a base salary of \$1,900 per month and a commission of 7.3% on the amount of sales made. If the salesperson has a paycheck of \$3,768.80 for one month, what was the amount of sales for the month? **Show work.**

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26. Let  $f(x) = 3x^2 - 7$  and  $g(x) = x - 6$ .

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

(b) Find  $(f \circ g)(2)$ . **Show work.**

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27. Find the exact solutions and simplify as much as possible:  $2x^2 + 5 = 2x$ . **Show work.**

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28. Given the function  $f(x) = \frac{6}{7} - \frac{1}{7}x$ , find a formula for the inverse function. **Show work.**

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29. Chocolate Confections, Inc. has determined that when  $x$  chocolate cakes are made daily, the average cost per chocolate cake is given by

$$C(x) = 0.001x^2 - 0.11x + 13.70$$

(a) What is the average cost per cake if 40 chocolate cakes are made daily?

(b) How many chocolate cakes should be made daily in order to minimize the average cost per cake? **Show work.**

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30. Solve:  $\frac{x-1}{x-3} = \frac{12}{x^2-9}$ . **Show work.**

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