

This is an open book exam. You may refer to your textbook and other course materials any number of times during the exam, as you may use a calculator. You must complete the exam on your own. Neither collaboration nor consultation with others is allowed.

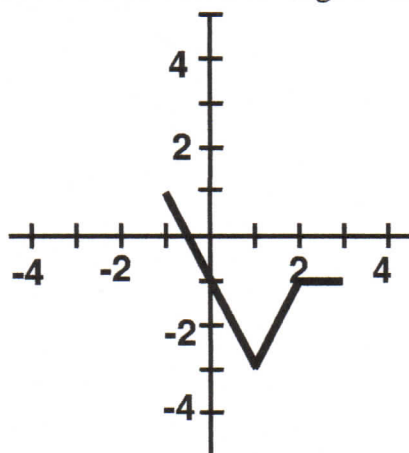
There are 30 problems.

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

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

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

1. _____



2. Solve: $\sqrt{15+2x} = -x$

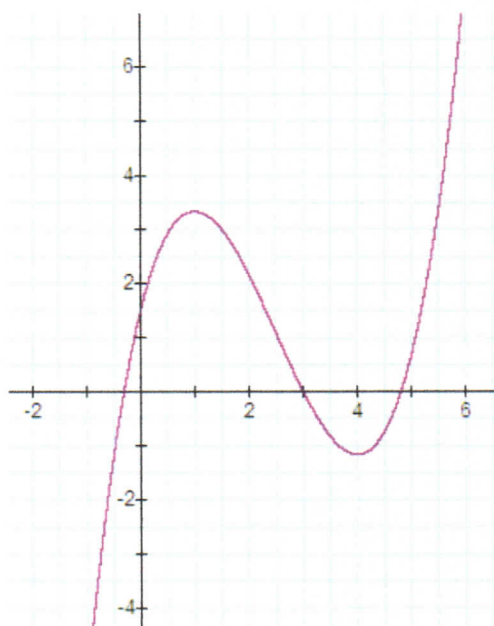
2. _____

- A. No solution
B. $-1/5$
C. $-3, 5$
D. -3

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

3. _____

- A. $(-1.25, 3.25)$
- B. $(1, 4)$
- C. $(-\infty, 1)$ and $(4, \infty)$
- D. $(-1/3, 3)$ and $(4.75, \infty)$



4. Determine whether the graph of $y = 5|x|$ 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 origin only
- C. symmetric with respect to the x -axis only
- D. symmetric with respect to the y -axis only

5. Solve, and express the answer in interval notation: $|8 - 6x| \geq 2$.

5. _____

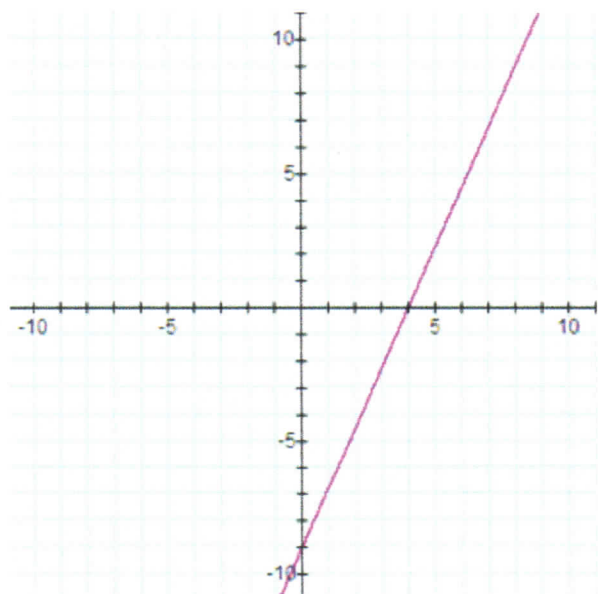
- A. $(-\infty, 5/3] \cup [1, \infty)$
- B. $[1, \infty)$
- C. $(-\infty, 1] \cup [5/3, \infty)$
- D. $[1, 5/3]$



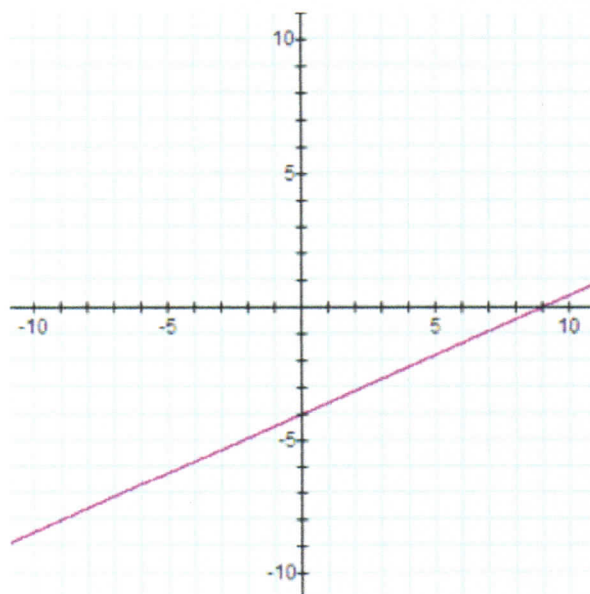
6. Which of the following represents the graph of $9x - 4y = 36$?

6. _____

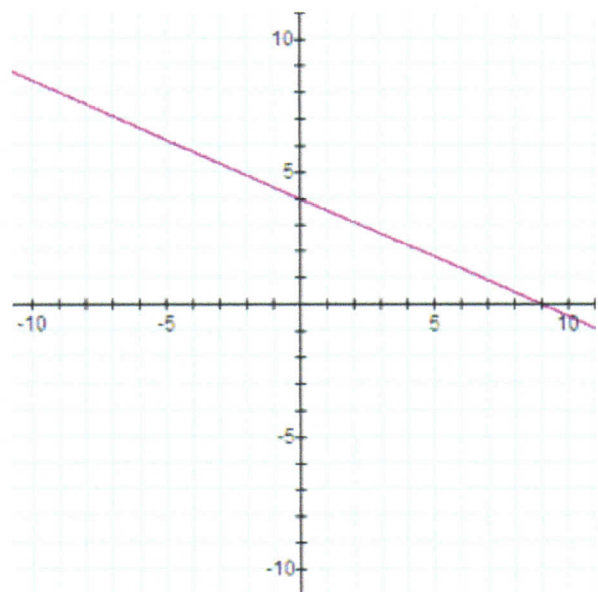
A.



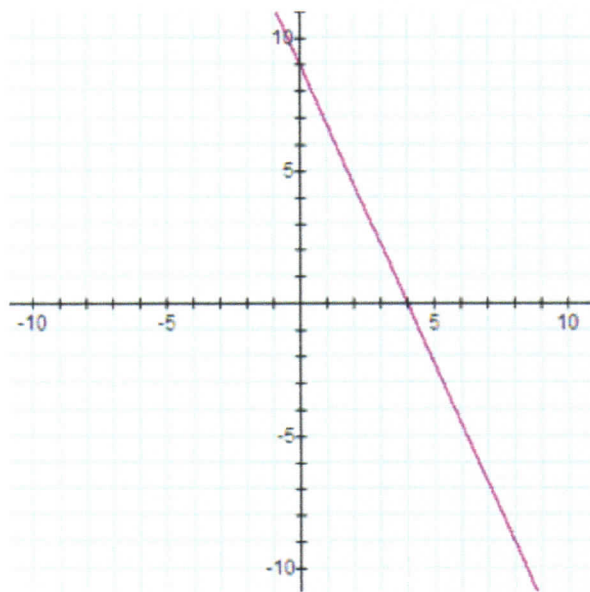
B.



C.



D.



7. Write a slope-intercept equation for a line parallel to the line $x - 4y = 6$ which passes through the point $(12, -3)$. 7. _____

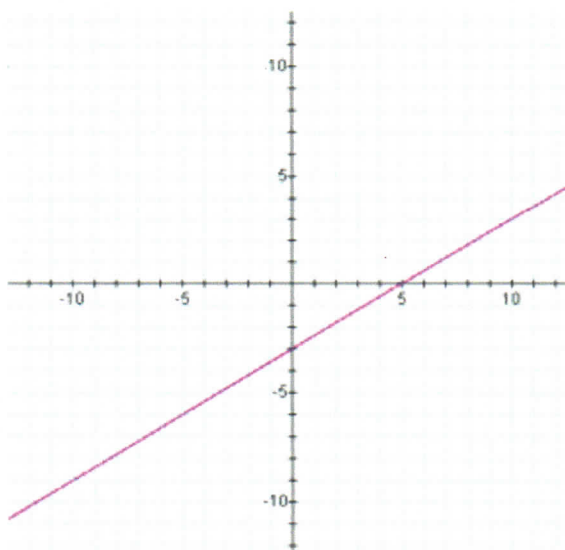
A. $y = -4x + 45$

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

C. $y = \frac{1}{4}x - 6$

D. $y = \frac{1}{4}x - 3$

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 a single logarithm: $\log x + \log 1 - 4 \log y$

9. _____

A. $\log \left(\frac{x+1}{y} \right)^4$

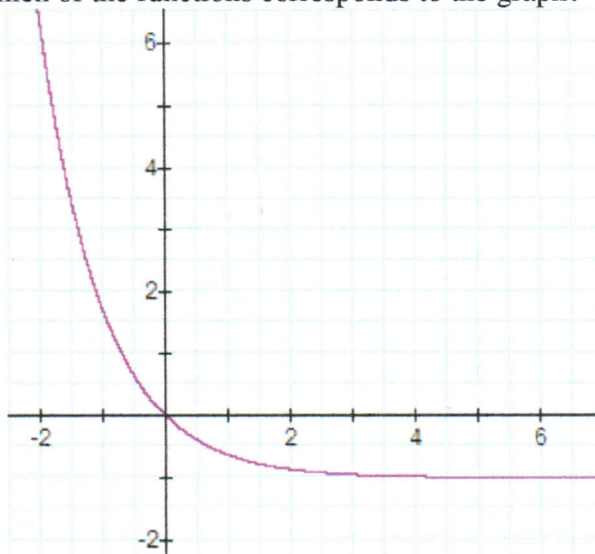
B. $\log (x+1-4y)$

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

D. $\log \left(\frac{x+1}{\sqrt[4]{y}} \right)$

10. Which of the functions corresponds to the graph?

10. _____



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

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

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

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

11. Suppose that a function f has exactly two x -intercepts.

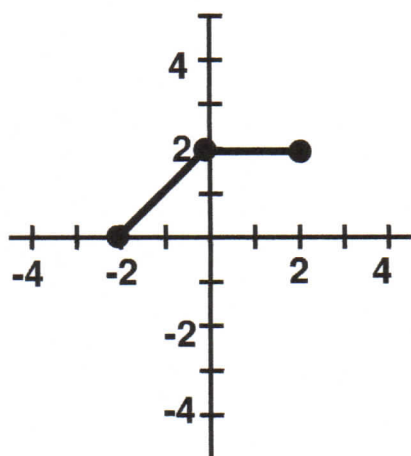
Which of the following statements MUST be true?

11. _____

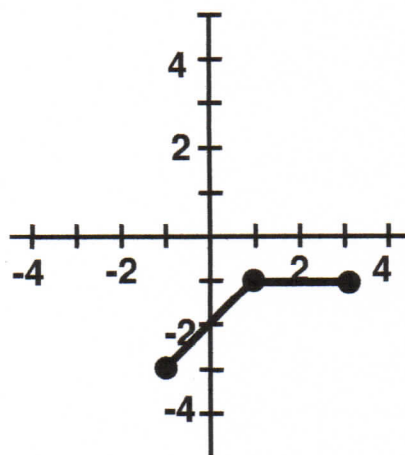
- A. f is a quadratic function.
- B. The equation $f(x) = 0$ has exactly two real-number solutions.
- C. f is an invertible function.
- D. The graph of f has exactly two points whose x -coordinates are 0.

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

SHORT ANSWER:

13. Multiply and simplify: $(3 - 4i)(8 + 7i)$.

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 83° F. is placed in a refrigerator that maintains a constant temperature of 35° F. The temperature T of the soda t minutes after it is placed in the refrigerator is given by

$$T(t) = 35 + 48 e^{-0.058 t}$$

Find the temperature of the soda 15 minutes after it is placed in the refrigerator. (Round to the nearest tenth of a degree.)

Answer: _____

16. Find the value of the logarithm: $\log_8 \left(\frac{1}{64} \right)$.

Answer: _____

17. Solve: $7^{9x+5} = 49$.

Answer: _____

18. Suppose \$2,600 is invested in an account at an annual interest rate of 7.7% compounded continuously. How long (to the nearest tenth of a year) will it take the investment to double in size?

Answer: _____

19. Let $f(x) = x^2 - 10x + 26$.

(a) Find the vertex.

Answer: _____

(b) State the range of the function.

Answer: _____

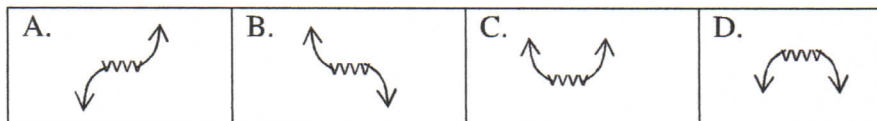
(c) On what interval is the function decreasing?

Answer: _____

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

$$P(x) = x^3 - 3x^2 - x + 3 = (x+1)(x-1)(x-3)$$

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



Answer: _____

(b) State the zeros of the function.

Answer: _____

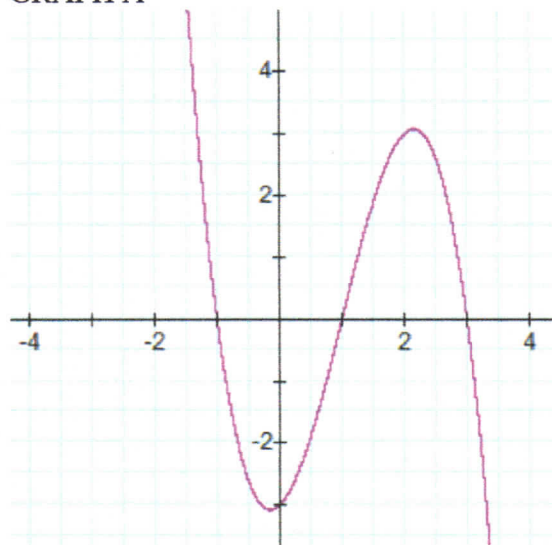
(c) State the y -intercept.

Answer: _____

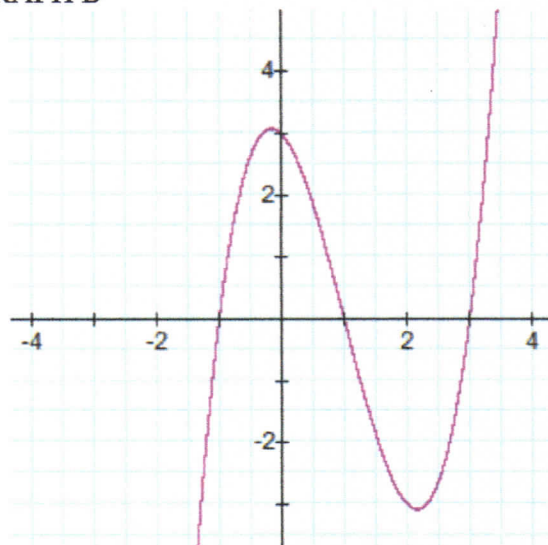
(d) State which graph below is the graph of $P(x)$.

Answer: _____

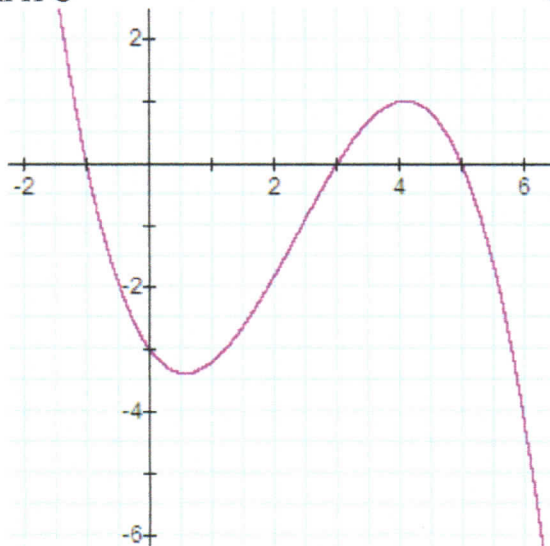
GRAPH A



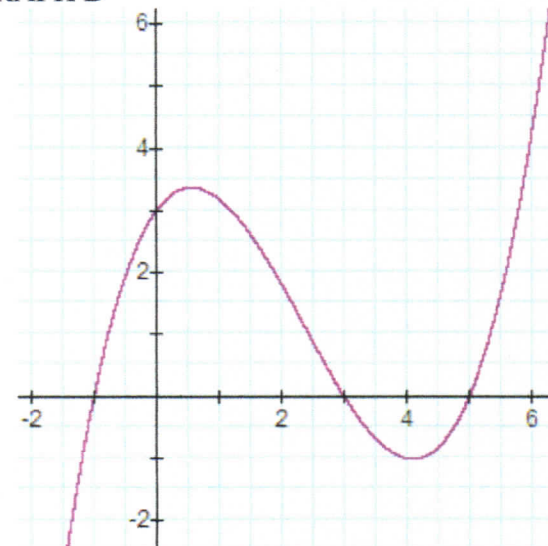
GRAPH B



GRAPH C



GRAPH D



21. Let $f(x) = \frac{5x}{x-3}$.

(a) State the domain.

Answer: _____

(b) State the vertical asymptote(s).

Answer: _____

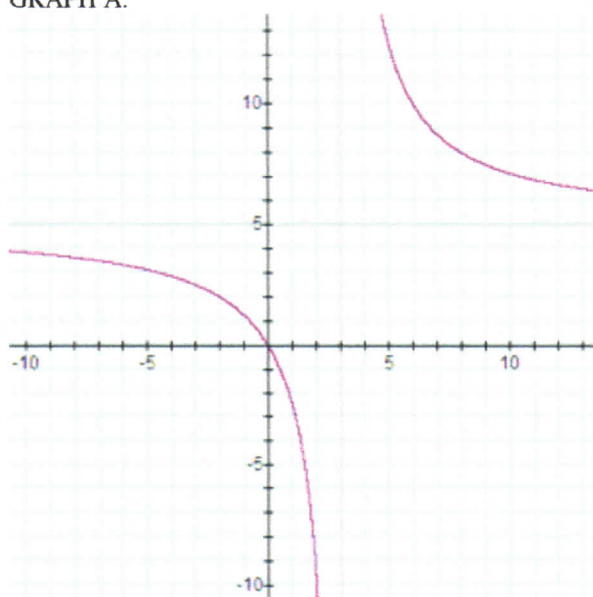
(c) State the horizontal asymptote.

Answer: _____

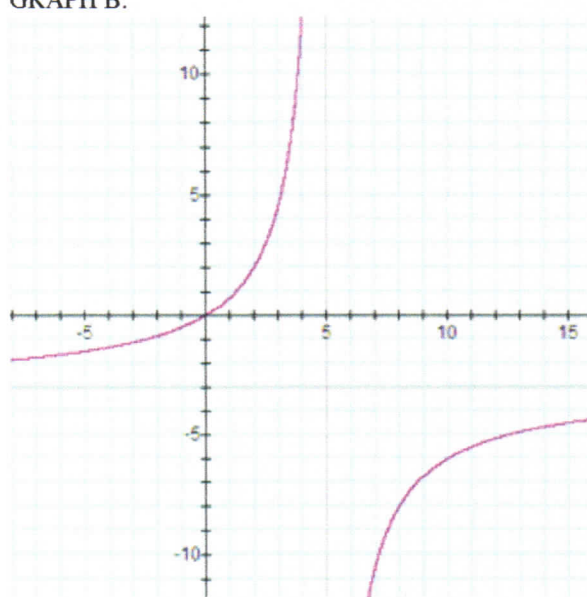
(d) Which of the following represents the graph of $f(x) = \frac{5x}{x-3}$?

Answer: _____

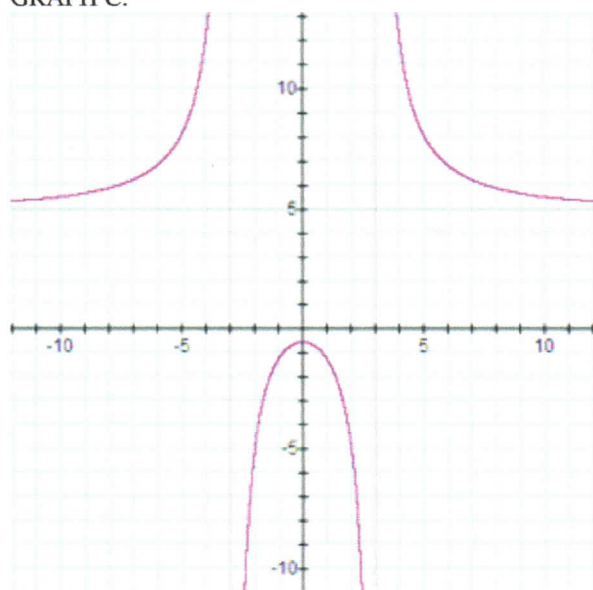
GRAPH A.



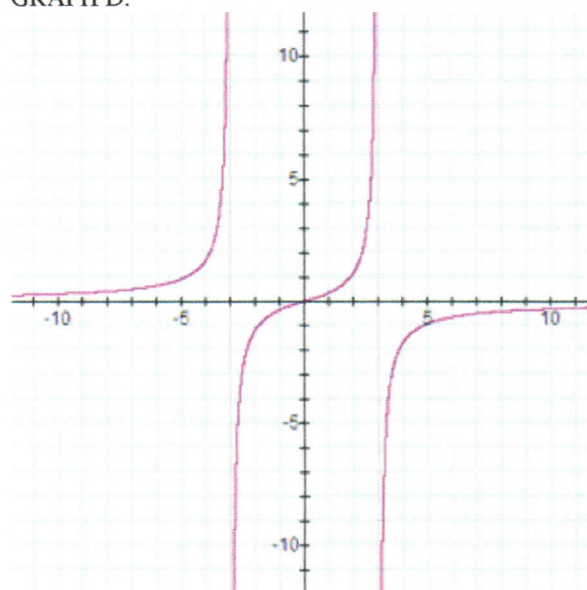
GRAPH B.



GRAPH C.



GRAPH D.



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

22. Let $f(x) = \sqrt{x-6}$ and $g(x) = x - 9$.

(a) Find $\left(\frac{f}{g}\right)(15)$. **Show work.**

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

23. Points $(7, -6)$ and $(9, 4)$ 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 y -axis.

24. Find the equation for a line which passes through the points $(7, 8)$ and $(9, -4)$. Write the equation in slope-intercept form. **Show work.**

25. Julie, a resident of Metropolis, pays Metropolis an annual tax of \$45 plus 1.6% of her annual income. If Julie paid \$877 in tax, what was Julie's income? **Show work.**

26. Let $f(x) = 7x^2 + 9$ and $g(x) = x - 1$.

(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: $2x^2 = 6x + 3$. **Show work.**

28. Given the function $f(x) = \frac{1}{5}x - 6$, find a formula for the inverse function. **Show work.**

29. Lee's Bakery has determined that when x chocolate cakes are made daily, the average cost per chocolate cake, in dollars, is given by

$$C(x) = 0.001x^2 - 0.13x + 12.03$$

(a) What is the average cost per cake if 50 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.**

30. Solve: $\frac{x-10}{x-7} + \frac{42}{x^2-49} = 0$. **Show work.**
