

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

There are 30 problems.

Problems #1–12 are Multiple Choice.

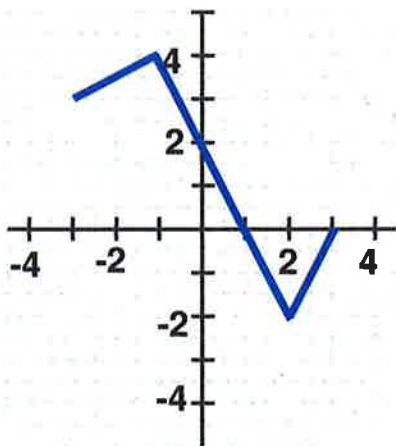
Problems #13–21 are Short Answer. (Work not required to be shown)

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

2. Solve: $\sqrt{8-7x} = -x$

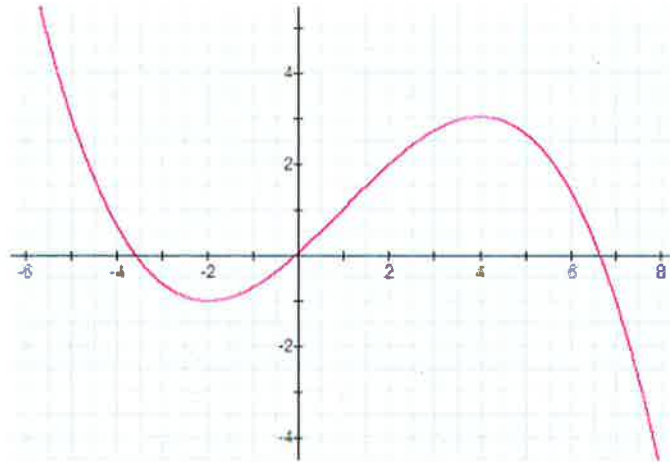
2. _____

- A. $4/3$
- B. -8
- C. $-8, 1$
- 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. $(-3.6, 6.7)$
- D. $(-2, 4)$



4. Determine whether the graph of $y = |2 + x|$ 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: $|6 - 5x| \leq 4$.

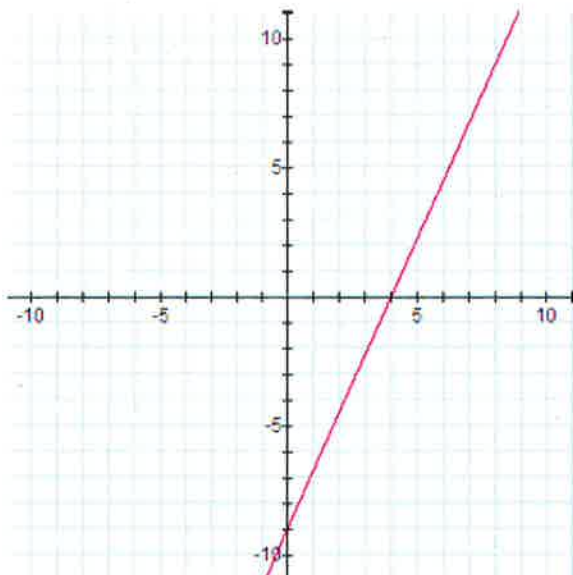
5. _____

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

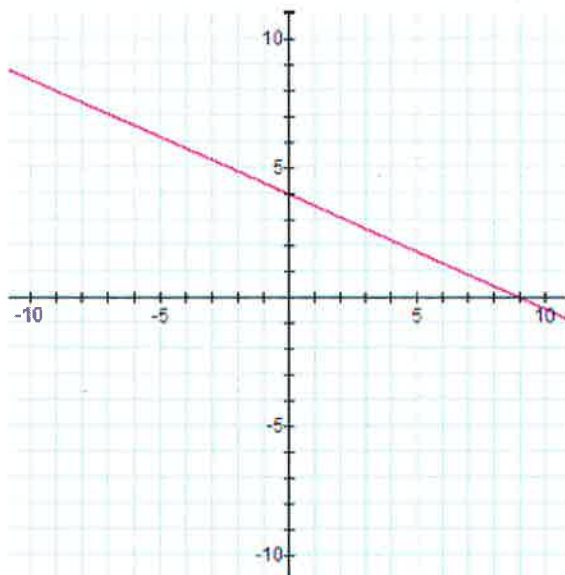
6. Which of the following represents the graph of $4x - 9y = 36$?

6. _____

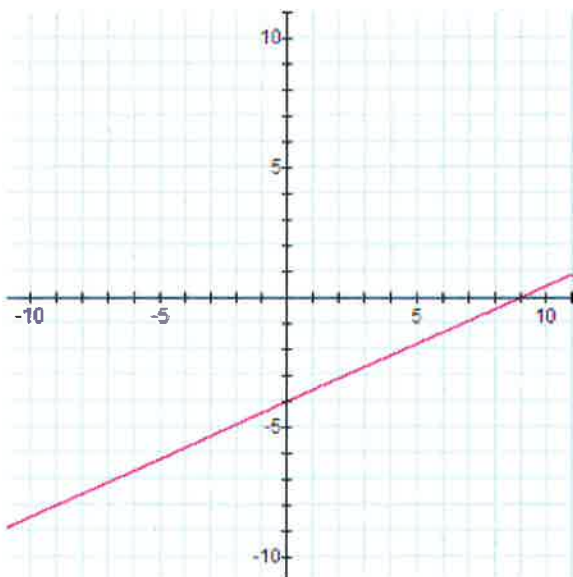
A.



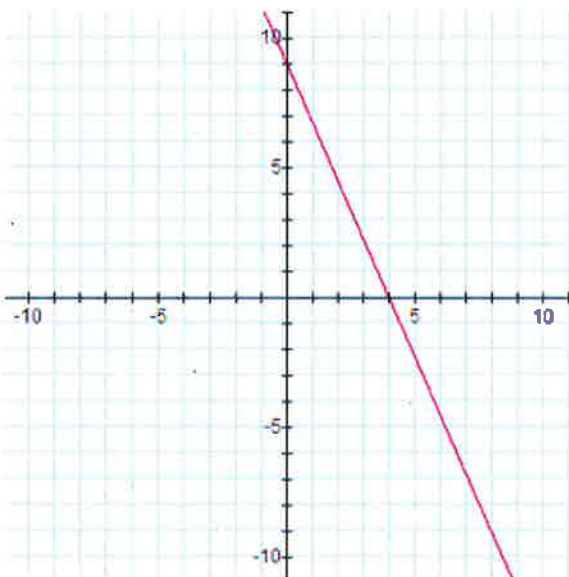
B.



C.



D.



7. Write a slope-intercept equation for a line parallel to the line $x - 8y = 3$ which passes through the point $(16, -5)$. 7. _____

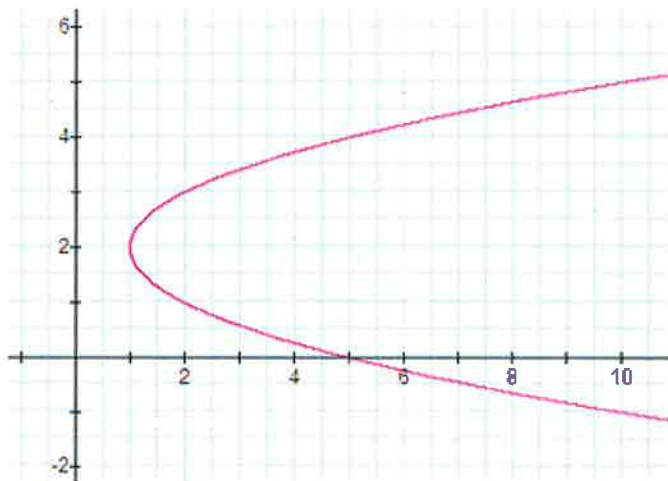
A. $y = -8x + 123$

B. $y = -\frac{1}{8}x - 3$

C. $y = \frac{1}{8}x - 7$

D. $y = \frac{1}{8}x - 5$

8. Which of the following best describes the graph? 8. _____



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

9. Express in equivalent form: $3\log x + \log 1 - \log (y + 1)$

9. _____

A. $\log \frac{3x}{y}$

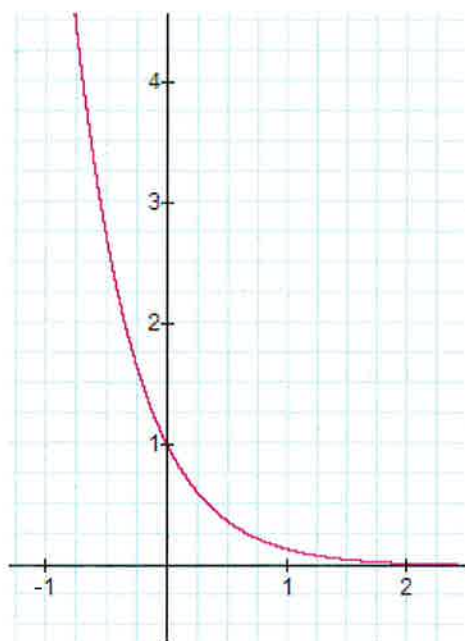
B. $\log (3x - y)$

C. $\frac{\log x^3}{\log (y + 1)}$

D. $\log \frac{x^3}{y + 1}$

10. Which of the functions corresponds to the graph?

10. _____



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

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

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

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

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

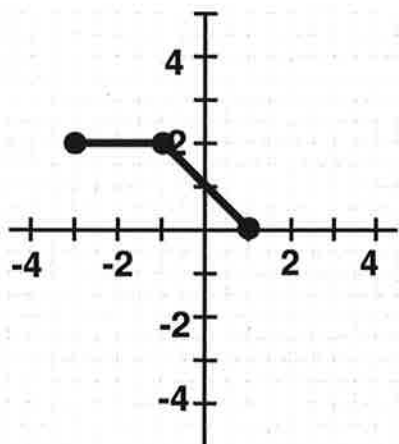
Which of the following statements MUST be true?

11. _____

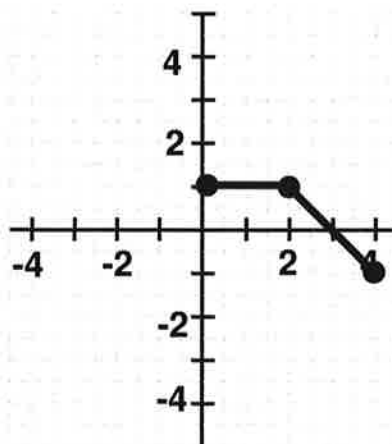
- A. f is an invertible function.
- B. f has exactly one x -intercept.
- C. $f(x) \geq 0$ for all x in the domain of f .
- D. f is a linear function.

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. $g(x) = f(x - 3) - 1$
- B. $g(x) = f(x + 2) - 3$
- C. $g(x) = f(x - 1) - 3$
- D. $g(x) = f(x - 1) - 1$

SHORT ANSWER:

13. Multiply and simplify: $(7 + 3i)(5 - 4i)$.

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: $\frac{x+9}{x-3} \geq 0$.

Answer: _____

15. A bowl of soup at 190° F. is placed in a room of constant temperature of 80° F. The temperature T of the soup t minutes after it is placed in the room is given by

$$T(t) = 80 + 110 e^{-0.075 t}$$

Find the temperature of the soup 16 minutes after it is placed in the room. (Round to the nearest degree.)

Answer: _____

16. Find the value of the logarithm: $\log_3\left(\frac{1}{27}\right)$.

Answer: _____

17. Solve: $5^{7x-2} = 25$.

Answer: _____

18. Suppose \$7,200 is invested in an account at an annual interest rate of 5.4% compounded continuously. How long (to the nearest tenth of a year) will it take the investment to double in size?

Answer: _____

19. Let $f(x) = x^2 - 4x + 1$.

(a) Find the vertex.

Answer: _____

(b) State the range of the function.

Answer: _____

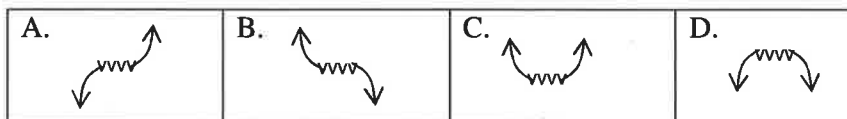
(c) On what interval is the function decreasing?

Answer: _____

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

$$P(x) = \frac{1}{4}x^4 - \frac{3}{2}x^3 + \frac{3}{4}x^2 + \frac{13}{2}x - 6 = \frac{1}{4}(x+2)(x-1)(x-3)(x-4)$$

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



Answer: _____

(b) State the y-intercept.

Answer: _____

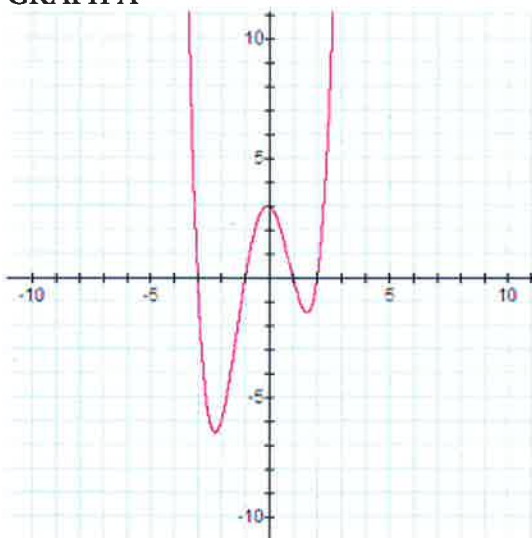
(c) State the zeros of the function.

Answer: _____

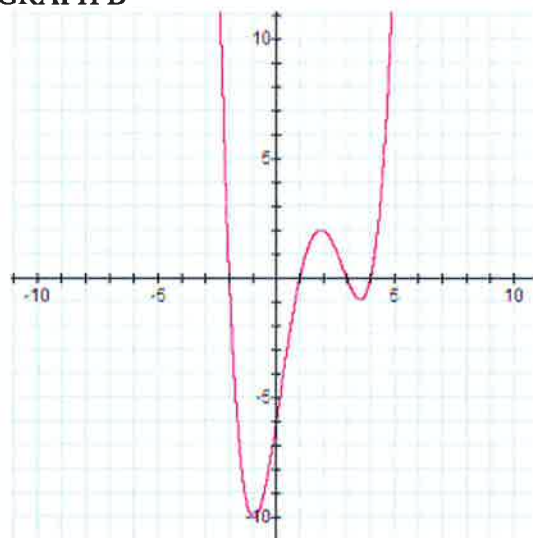
(d) State which graph below is the graph of $P(x)$.

Answer: _____

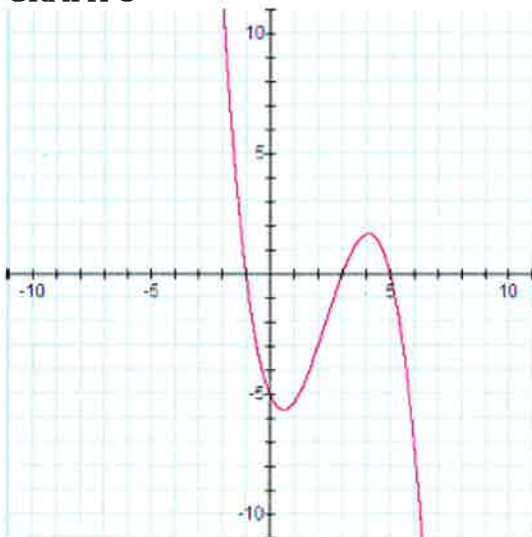
GRAPH A



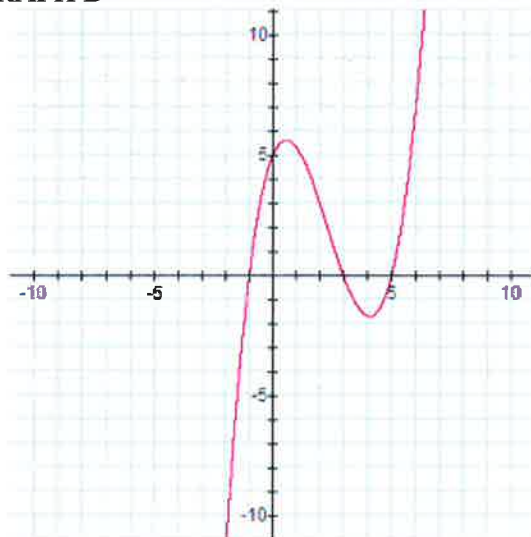
GRAPH B



GRAPH C



GRAPH D



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

(a) State the domain.

Answer: _____

(b) State the vertical asymptote(s).

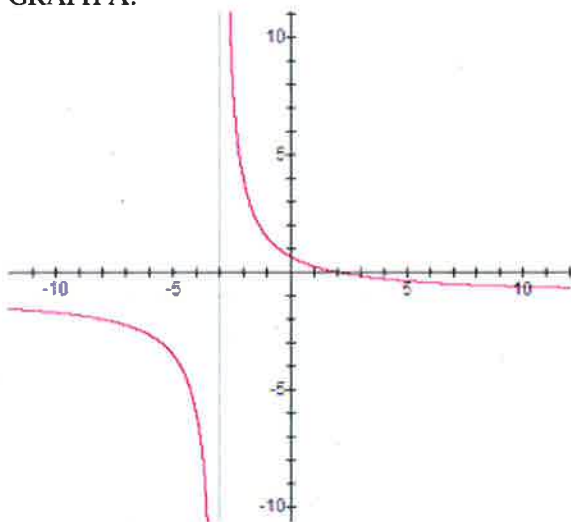
Answer: _____

(c) State the horizontal asymptote.

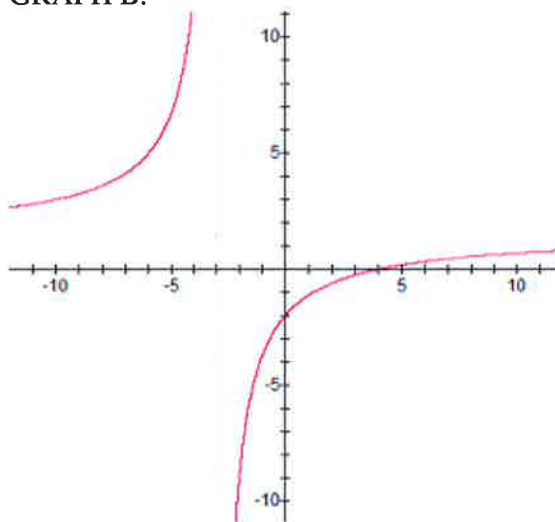
Answer: _____

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

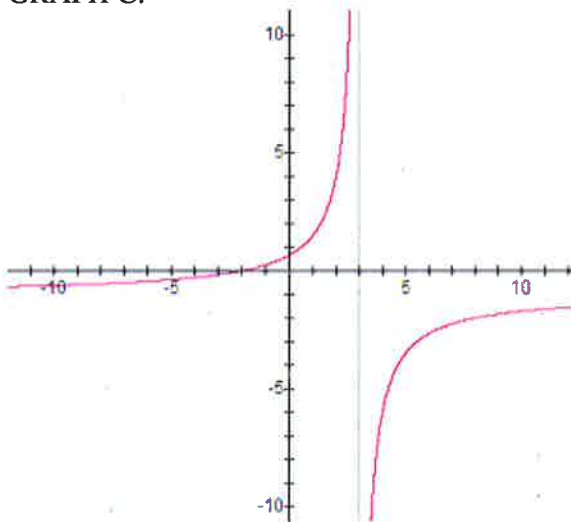
GRAPH A.



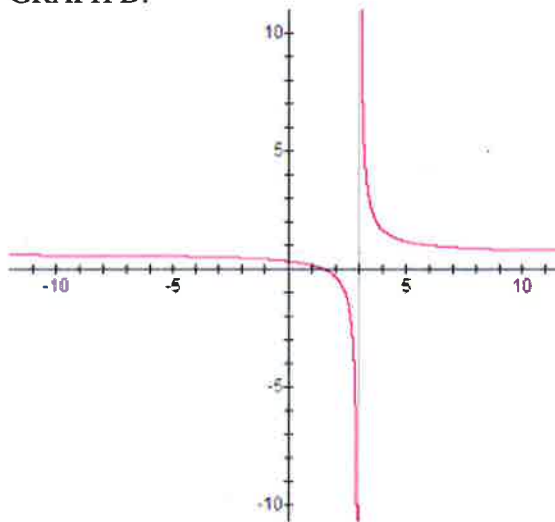
GRAPH B.



GRAPH C.



GRAPH D.



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

22. Let $f(x) = x - 7$ and $g(x) = \sqrt{x + 3}$.

(a) Find $\left(\frac{f}{g}\right)(6)$. **Show work.**

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

23. Points $(2, -5)$ and $(4, 3)$ 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 $(9, -1)$ and $(7, 3)$. Write the equation in slope-intercept form. **Show work.**

25. Kathy, a resident of Metropolis, pays Metropolis an annual tax of \$60 plus 2.2% of her annual income. If Kathy paid \$1,974 in tax, what was Kathy's income? **Show work.**

26. Let $f(x) = 4x^2 - 7$ and $g(x) = x - 3$.

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

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

27. Find the exact solutions and simplify as much as possible: $11x^2 + 2 = 10x$. **Show work.**

28. Given the function $f(x) = \frac{5}{8} - \frac{1}{8}x$, find a formula for the inverse function. **Show work.**

29. The fuel efficiency F for a particular car is given by

$$F(x) = -0.018x^2 + 1.656x + 2.4$$

where x is the speed of the car in miles per hour (mph) and $F(x)$ is the corresponding fuel efficiency in miles per gallon (mpg).

(a) What is the fuel efficiency if the car's speed is 65 mph?

(b) What speed will yield the maximum fuel efficiency? **Show work.**

30. Solve: $\frac{x+7}{x+2} + \frac{20}{x^2-4} = 0$. **Show work.**

MULTIPLE CHOICE. Record your answer choices.

- | | |
|----|-----|
| 1. | 7. |
| 2. | 8. |
| 3. | 9. |
| 4. | 10. |
| 5. | 11. |
| 6. | 12. |

SHORT ANSWER. Record your answers below.

13.

14.

15.

16.

17.

18.

19. (a)

(b)

(c)

20. (a)

(b)

(c)

(d)

21. (a)

(b)

(c)

(d)

SHORT ANSWER with Work Shown. Record your answers and work.

Problem Number	Solution
22	Answers: (a) (b) Work/for part (a) and explanation for part (b):
23	Answers: (a) (b) (c) Work for part (a):

24	Answer: Work:
25	Answer: Work:
26	Answers: (a) (b) Work for part (a) and for part (b):

27	Answer: Work:
28	Answer: Work:

29	Answers: (a) (b) Work for (b):
30	Answer: Work: