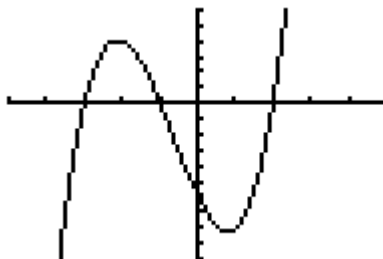


**Arkansas Council of Teachers of Mathematics
Algebra I Regional Exam Spring 2009**

Select the best answer for each of the following questions and mark it on the answer sheet provided. Be sure to read all the answer choices before making your selection. When you are finished with the multiple-choice questions, please attempt the tiebreaker questions.

1. Determine the zeros of the function $y = x^3 + 2x^2 - 5x - 6$ modeled by the following graph.

- a) $x = -2, 1, 3$
- b) $x = -3, -1, -6, 2$
- c) $x = -6$
- d) $x = -3, -1, 2$

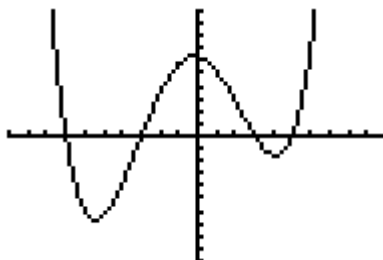


2. Write a verbal expression for $2x + y^2$.

- a) The product of two times x and y squared.
- b) The sum of two times x and y squared.
- c) Two times the sum of x and y squared.
- d) The sum of two times x and y.

3. Given the following graph, determine over which interval(s) the function is greater than zero.

- a) $(-\infty, -7) \cup (-3, 3) \cup (5, \infty)$
- b) $(0, \infty)$
- c) $(-\infty, -7] \cup [-3, 3] \cup [5, \infty)$
- d) $(-7, -3) \cup (3, 5)$

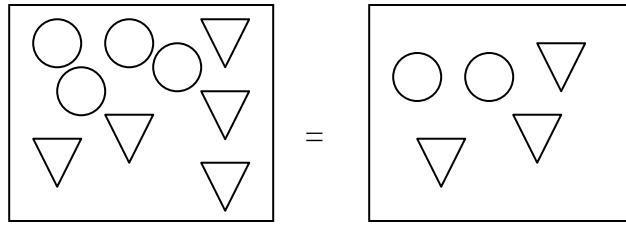


4. Find the range of the function rule $f(x) = -x - 7$ for the domain $\{-9, 0, 15\}$.

- a) $\{-12, -7, 8\}$
- b) $\{-8, 7, 14\}$
- c) $\{-22, -7, 2\}$
- d) $\{-22, -12, -7\}$

5. If $a = \begin{bmatrix} 1 & 2 & -1 \\ 5 & 0 & 4 \end{bmatrix}$, what is $3a$?

- a) $\begin{bmatrix} 4 & 5 & 2 \\ 8 & 3 & 7 \end{bmatrix}$
- b) $\begin{bmatrix} 3 & 6 & -3 \\ 15 & 0 & 12 \end{bmatrix}$
- c) $\begin{bmatrix} 2 & 5 & 9 \\ 12 & 15 & 0 \end{bmatrix}$
- d) $\begin{bmatrix} 3 & 6 & 3 \\ 15 & 0 & 12 \end{bmatrix}$



6. Let \bigcirc represent negative x ($-x$) and let ∇ represent 1. Find the value of x so that the diagram is true.

- a) $x = \frac{4}{3}$
- b) $x = 1$
- c) $x = -1$
- d) $x = -\frac{4}{3}$

7. Find the relative minimum, maximum, vertex, and zero, if possible, of the following graph.



- a) min: -7 at $x = 1$
max: -3 at $x = -1$
vertex: $(0, -6)$
zero: $(2, 0)$
- b) min: -7 at $x = -1$
max: -3 at $x = 1$
zero: $(0, -6)$
- c) min: 1 at $x = -7$
max: -1 at $x = -3$
vertex: $(0, -6)$
- d) min: -7 at $x = 1$
max: -3 at $x = -1$
zero: $(2, 0)$

8. Nicky and Rachel are riding in a hot air balloon. Use the table below to find i) the rate of change and ii) how high they will be after 8 minutes.

Time	Height
1 minute	50 feet
3 minutes	150 feet
5 minutes	250 feet

- a) $50 \text{ ft}/\text{min}$; 450 feet
- b) $\frac{1}{50} \text{ ft}/\text{min}$; 400 feet
- c) $50 \text{ ft}/\text{min}$; 400 feet
- d) $\frac{1}{50} \text{ ft}/\text{min}$; 450 feet

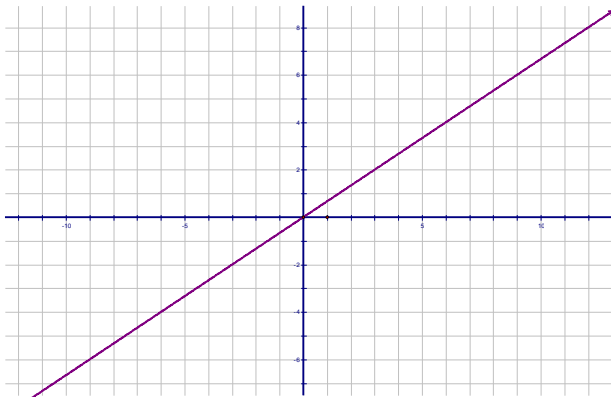
9. Jessica bought a car for \$15,000 and its value depreciated linearly. After 3 years the value was \$11,250. What is the amount of yearly depreciation?

- a) \$1250
- b) \$3750
- c) \$6250
- d) \$7500

10. Describe the transformation from $y = 3(x - 2)^2 - 2$ to $y = 3(x + 2)^2 + 7$

- a) shift up 7, shift left 2
- b) shift up 9, shift left 4
- c) shift up 4, shift right 9
- d) shift up 9, shift right 4

11. The following graph represents $y = \frac{2}{3}x$



If the line in the graph is shifted down 3 units, which of the following choices is the equation for the new line?

- a) $y = -\frac{2}{3}x$
- b) $y = \frac{2}{3}x + 3$
- c) $y = \frac{2}{3}(x - 3)$
- d) $y = \frac{2}{3}x - 3$

12. If the graph of a line has a positive slope and a negative y-intercept, what happens to the x-intercept if the slope and the y-intercept are doubled?

- a) The x-intercept remains the same.
- b) The x-intercept becomes twice as large.
- c) The x-intercept becomes one-fourth as large.
- d) The x-intercept becomes four times as large.

13. Write the equation of the line that is perpendicular to $y = \frac{1}{2}x + 3$ and passes through the point $(-\frac{1}{2}, 1)$.

- a) $y = \frac{1}{2}x + 3$
- b) $y = -2x - 10$
- c) $y = -2x$
- d) $y = \frac{1}{2}x$

14. Matt is at a gas station and is having trouble choosing between a 32 oz bottle of Gatorade for \$2.19 and a 12 oz can of Sprite for \$1. Which one is the better deal?

- a) Sprite is the better deal because it's \$1.
- b) Gatorade is the better deal because it's cheaper per ounce.
- c) Gatorade is the better deal because it has 20 more ounces than the Sprite.
- d) Sprite is the better deal because it's cheaper per ounce.

15. Simplify the expression: $-3\sqrt{3} - 4\sqrt{9} + 4\sqrt{12}$

- a) $5\sqrt{3} - 12$
- b) $11\sqrt{3} - 12$
- c) $5\sqrt{3} - 36$
- d) $11\sqrt{3} - 36$

16. Rewrite the expression using positive exponents: $\frac{1}{8x^{-3}y^{-2}}$.

- a) $8x^3y^2$
- b) $\frac{(xy)^5}{8}$
- c) $\frac{x^3y^2}{8}$
- d) $8xy^5$

17. Simplify the expression $\frac{4x^4y^{-2}}{x^{-3}y^3} \cdot \frac{(4x^3y)^{-2}}{xy^{-2}}$.

- a) $\frac{16x^3}{y^5}$
- b) $-\frac{32x^{12}}{y^3}$
- c) $-\frac{1}{2x^4y^2}$
- d) $\frac{1}{4y^5}$

18. If $(3, -7)$ is a midpoint of a line segment and $(9, 3)$ is an endpoint of that same line segment, find the other endpoint.

- a) $(-3, -17)$
- b) $(15, 13)$
- c) $(6, -2)$
- d) $(-3, 11)$

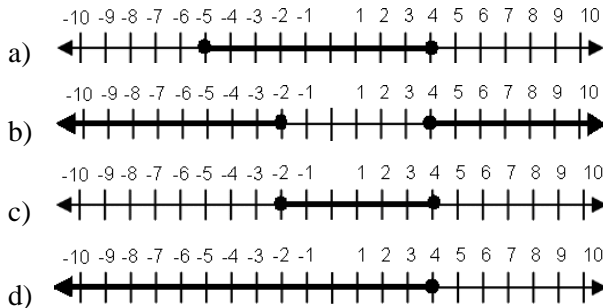
19. Solve the following quadratic equation by factoring.

$$2x^2 - 3 = x$$

- a) $x = -1$
- b) $x = -\frac{3}{2}, 1$
- c) $x = 1, \frac{3}{2}$
- d) $x = -1, \frac{3}{2}$

20. Determine the correct solution set of the following inequality.

$$2|x - 1| + 3 \leq 9$$



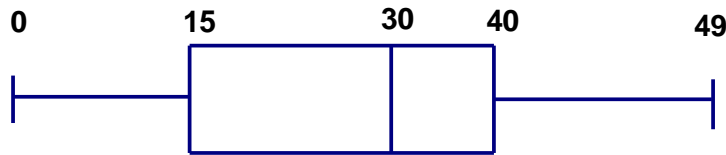
21. An automobile race at the Bristol Motor Speedway has 18 entrants. In how many ways can first, second, and third place be awarded?

- a) 51
- b) 54
- c) 816
- d) 4896

22. Darbi is recording the lengths of different mockingbird songs. Seven of the songs she recorded have lengths of 1.9, 3.4, 2.8, 5.4, 4.1, 6.9, 5.5 seconds. What song length for the eighth song would make the median length equal to 4.1 seconds?

- a) 4.75
- b) 4.1
- c) 3.75
- d) 2.8

23. Given the following box and whisker plot, what is the interquartile range?



- a) 25
- b) 44
- c) 15
- d) 10

24. In which data set is the median value equal to the mean value?

- a) {2, 4, 6, 7, 8}
- b) {12, 18, 20, 23, 24}
- c) {50, 60, 65, 75, 85}
- d) {12, 17, 18, 20, 23, 24}

25. The time it takes an Olympic marathoner to complete the 26 mile race is inversely proportional to his/her speed. Given that the marathoner is running at an average speed of 12 mph, how long did it take the marathoner to finish the race?

- a) About 2 hr. 10 min
- b) About 2 hr. 17 min
- c) About 30 min
- d) About 2 hr. 16 min

Algebra I Tie Breakers
ACTM Regional Contest 2009

Name _____

In the event of a tie, the following questions will be graded in order. Please work them consecutively and show all your work.

Tie-Breaker #1

It took Brent 12 minutes to bathe his dog. The following table shows the increase in the amount of water Brent used as time passed.

Minutes (x)	Amount of Water Used (Gallons)
.5	1.25
1.5	3.75
2.5	6.25
3.5	8.75
4.5	11.25

a) Write an equation that represents the amount of water used as a function of the amount of time it took to bathe the dog. Show all of your work.

b) Determine the amount of water used when $\frac{3}{4}$ of the time had passed. Show all of your work. Include units in your answer.

Name _____

Tie-Breaker #3

From an 8 foot by $10\frac{1}{2}$ foot piece of cardboard, square corners are cut out so that the sides can be folded up to make a box.

Determine the total area of the square cut outs such that the resulting box has a maximum volume. Show all of your work.

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Answer Key

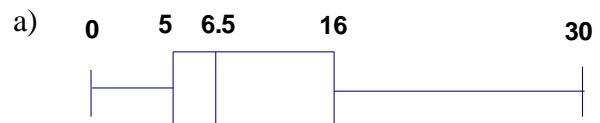
1. d
2. b
3. a
4. c
5. b
6. b
7. d
8. c
9. a
10. b
11. d
12. a
13. c
14. b
15. a
16. c
17. d
18. a
19. d
20. c
21. d
22. b
23. a
24. d
25. a

Tie Breaker #1

a) $m = 2.5$
 $y - 1.25 = 2.5(x - 0.5)$
 $y = 2.5x$

b) $\frac{3}{4} \cdot 12 = 9$
 $2.5(9) = 22.5$ gallons

Tie Breaker #2



- b) 64.3%
- c) Yes, since the temperature was below 10, then above 10, at some point it had to be 10 degrees.

Tie Breaker #3

a) height of box with max volume $x = 1.5$ ft
total area of cut outs $4x^2 = 9$ sq ft