

**ADVANCED MATH TEAM TEST**  
**KCATM 2014**

Name \_\_\_\_\_  
Grade \_\_\_\_\_

1. Solve for x:  $2x - 1 < 4x + 3$

- a) 2                      b)  $x > -2$                       c)  $x < -1$                       d) 0                      e) not given

2. Find the distance between the points A (1, 2) and B (-2, 6).

- a) 5                      b) 7                      c) 12                      d) 13                      e) not given

3. Find the x – intercepts of for the equation  $2x - 3y = 3$ .

- a) (1, 0)                      b) (-1, 0)                      c) (-3, 0)                      d) (1.5, 0)                      e) not given

4. Find  $(g \circ f)(x)$  for  $f(x) = \sqrt{x-1}$  and  $g(x) = \frac{1}{x^2}$ .

- a) x                      b)  $\frac{1}{x^2}$                       c)  $\frac{1}{x-1}$                       d)  $\sqrt{x-1}$                       e) not given

5. Find the equation of the line passing through the points (2, 3) and (-4, 0).

- a)  $x - 2y - 4 = 0$                       b)  $x - 2y + 4 = 0$                       c)  $x + 2y - 4 = 0$                       d)  $x + 2y + 4 = 0$                       e) not given

6. Find the quadratic function with vertex (1, 2) that contains the point (3, 0).

- a)  $f(x) = x^2 + 2x - 3$                       b)  $f(x) = x^2 + 2x + 3$                       c)  $f(x) = x^2 - 2x + 3$                       d)  $f(x) = x^2 - 2x - 3$                       e) not given

7. Find the zeros for  $f(x) = x^3 + 2x^2 - x - 2$ .

- a) 1, 1, 2                      b) -1, -1, -2                      c) 1, 1, -2                      d) 1, -1, -2                      e) not given

8. Determine the product of  $2 + 3i$  and  $5 - 7i$ .

- a)  $7 - 4i$                       b)  $10 - 21i$                       c)  $31 + i$                       d)  $-3 + 4i$                       e) not given

9. Solve for x:  $2x + 5 = \frac{x}{3}$

- a) -3                      b)  $3, \frac{1}{2}$                       c)  $\frac{-13}{6}$                       d) no solution                      e) not given

10. Choose the equivalent expression to  $\frac{\sqrt[3]{x}}{\sqrt[4]{x}}$ .

- a)  $\sqrt[4]{x}$       b)  $\sqrt[3]{x}$       c)  $x^{\frac{4}{3}}$       d)  $x^{\frac{1}{12}}$       e) not given

11. Solve for x:  $2^{x-1} \cdot 3^{x-1} = 216$

- a)  $\ln 216$       b) 4      c)  $\sqrt{\frac{3}{2}}$       d) 2      e) not given

12. For what value(s) of  $c$  are the roots of  $3x^2 - 12x + c = 0$ ?

- a) -12      b) 12      c)  $\pm 4$       d) 4      e) not given

13. Successive discounts of 20% and 30% are equivalent to which single discount?

- a) 30%      b) 15%      c) 25%      d) 28%      e) not given

14. How many different ways can a committee of 4 be chosen from a group of 8 people?

- a) 40320      b) 1680      c) 70      d) 4      e) not given

15. Simplify.  $x^{-1} + x^{-2} =$

- a)  $\frac{1}{x^3}$       b)  $\frac{2}{x^3}$       c)  $\frac{2}{x}$       d)  $\frac{x+1}{x^2}$       e) not given

16. Solve for x:  $\sqrt{x+1} - \sqrt{x} = 1$

- a) 1      b) no solution      c)  $\frac{1}{4}$       d) 0      e) not given

17. Which of the following is **not** a pair of inverse functions?

- a)  $f(x) = x + 7$ ;  $g(x) = x - 7$       b)  $f(x) = 4x$ ;  $g(x) = \frac{1}{4}x$       c)  $f(x) = x^3$ ;  $g(x) = x^{-3}$   
d)  $f(x) = e^x$ ;  $g(x) = \ln x$       e) not given

18. Express  $\left(\frac{2x^{-1}y^5}{x^5y^{-1}}\right)^{-2}$  in simplest form.

- a)  $\frac{1}{4x^8y^4}$       b)  $\frac{x^{16}y^{12}}{4}$       c)  $\frac{2x^2}{y^4}$       d)  $\frac{-4}{x^9y^6}$       e) not given

19. Find the center of the circle whose equation is  $x^2 + y^2 + 8x - 12y + 43 = 0$ .
- a) (-4, 6)                      b) (4, -6)                      c) (8, -12)                      d) (-8, -12)                      e) not given
20. The weight of adult Newfoundland dogs have approximately a normal distribution, with a mean of 140 lbs. and a standard deviation of 20lbs. Suppose that a Newfoundland dog is considered overweight if it weighs more than 170 lbs. What percentage of these dogs is overweight?
- a) about 5%                      b) about 7%                      c) about 10%                      d) about 20%                      e) not given
21. Augmented matrices may be used to solve a system of linear equations. Which of the following would **not** be a valid operation to perform on the augmented matrix?
- a) Interchange two rows                      b) Add the same non-zero number to every entry in the row                      c) Multiply every entry in the row by the same positive number
- d) Subtract a multiple of one row from another row                      e) All are valid
22. Given  $h(x) = 2x^2 + 6x - 9$  and  $g(x) = 3x^2 - 8x + 8$ , find  $h(x) - 2g(x)$ .
- a)  $-4x^2 + 22x - 25$                       b)  $-4x^2 - 14x + 17$                       c)  $-4x^2 + 14x - 17$                       d)  $-4x^2 - 10x + 7$                       e) not given
23. Solve for x:  $\frac{2x}{x^2 - 7x - 18} = \frac{6x}{x^2 + x - 2}$
- a) 0; -13                      b) -2; 9; 1                      c) -2; -13; 0                      d) 0; 13                      e) not given
24. Simplify the function:  $R(x) = \frac{10 - x^2 - 3x}{x^2 + 2x - 8}$
- a)  $\frac{-x-5}{x+4}; x \neq -4$                       b)  $\frac{-x-5}{x+4}; x \neq -4, 2$                       c)  $\frac{x+5}{x+4}; x \neq -4, 2$                       d)  $\frac{x+5}{x+4}; x \neq -4$                       e) not given
25. If  $f(x) = 2x^2 + 3x - 5$  and  $g(x) = \sqrt{x+1}$ , find  $f(g(2x))$ .
- a)  $8x^2 + 6x - 5$                       b)  $8x + 6\sqrt{x+1} + 3$                       c)  $2x + 3\sqrt{x+1} - 3$                       d)  $4x + 3\sqrt{2x+1} - 3$                       e) not given

26. Solve for  $x$ :  $(x+31)^{\frac{1}{2}} = x+1$

- a) -6                      b) 5; -6                      c) 5                      d) no solution                      e) not given

27. Simplify  $e^{-2\ln(x)+\ln(3)}$ .

- a)  $\frac{3}{x^2}$                       b)  $\frac{3}{2x}$                       c)  $-6x$                       d)  $\sqrt{3x}$                       e) not given

28. A batter hits a pitched softball when it is 3 feet off the ground. After it is hit, the height  $h$  (in feet) of the ball at time  $t$  (in seconds) is given by  $h = -16t^2 + 80t + 3$ . What is the maximum height the ball will reach?

- a) 103 feet                      b) 80 feet                      c) 135 feet                      d) 204 feet                      e) not given

29. Which of the following expressions is equivalent to  $4ab\sqrt{2b} - 3a\sqrt{18b^3} + 7ab\sqrt{6b}$ ?

- a)  $2ab\sqrt{6b}$                       b)  $16ab\sqrt{2b}$                       c)  $-5ab+7ab\sqrt{6b}$                       d)  $-5ab\sqrt{2b}+7ab\sqrt{6b}$                       e) not given

30. Written in simplest form, the expression  $\frac{\frac{x}{1} - \frac{1}{x}}{\frac{4}{2x} + \frac{x}{4}}$  is equivalent to which of the following?

- a)  $x-1$                       b)  $x-2$                       c)  $\frac{x-2}{2}$                       d)  $\frac{x^2-4}{x+2}$                       e) not given

31. Which of the following is the domain of the function  $2e^{-x} - 3$ ?

- a)  $(-\infty, \infty)$                       b)  $[-3, \infty)$                       c)  $[-1, \infty)$                       d)  $(-\infty, 3]$                       e) not given

32. Given the parametric equations  $x(t) = 5t$  and  $y(t) = 3 - 3t$  with  $0 \leq t \leq 1$ ; which of the following best describes the graph?

- a) circle                      b) parabola                      c) line                      d) line segment                      e) not given

33. Find the center and radius of the circle whose equation is  $x^2 + y^2 + 2x - 4y - 4 = 0$ .

- a)  $(-1, 1); 2$                       b)  $(1, -2); 4$                       c)  $(-1, 2); 3$                       d)  $(1, 2); 3$                       e) not given

34. In how many ways can a class of 30 students select a president, vice-president and secretary?

- a) 10                      b) 87                      c) 4060                      d) 24, 360                      e) not given

35. Which expression is equal to  $\log(x) + 4\log(y) - 2\log(z)$ ?

- a)  $\log(-8xyz)$                       b)  $\log\left(\frac{4xy}{2z}\right)$                       c)  $\log\left(\frac{x^4y}{z^2}\right)$                       d)  $\log\left(\frac{xy^4}{z^2}\right)$                       e) not given

36. Find the exact value of x for the equation  $17e^{4x} = 85$ .

- a)  $\frac{5}{4}$                       b)  $\frac{\ln 85}{17 \ln 4}$                       c)  $\frac{\ln 5}{4}$                       d)  $\frac{\ln 85 - \ln 17}{\ln 4}$                       e) not given

37. An investment of \$750 will be worth \$1500 after 12 years of continuous compounding at a fixed interest rate. Find the interest rate to the nearest hundredth.

- a) 2.00%                      b) 5.78%                      c) 6.93%                      d) 200%                      e) not given

38. What is the length of the major axis on the graph of  $\frac{x^2}{100} + \frac{y^2}{64} = 1$ ?

- a) 12                      b)  $2\sqrt{41}$                       c) 16                      d) 20                      e) not given

39. Which expression defines the series  $14 + 20 + 26 + 32 + 38 + 44 + 50$ ?

- a)  $\sum_{n=2}^8 (7n-1)$                       b)  $\sum_{n=3}^8 (6n-4)$                       c)  $\sum_{n=3}^9 (6n-4)$                       d)  $\sum_{n=8}^{14} (n+6)$                       e) not given

40. Which is the equation of an inverse variation for which  $x = 5$  and  $y = -28$ ?

- a)  $y = \frac{-140}{x}$                       b)  $y = \frac{-x}{130}$                       c)  $y = \frac{-x}{140}$                       d)  $y = \frac{-130}{x}$                       e) not given

**KCATM 2014**

**ADVANCED MATH TEAM TEST ANSWERS**

1. B
2. A
3. D
4. C
5. B
6. E
7. D
8. C
9. A
10. D
11. B
12. B
13. E
14. C
15. D
16. D
17. C
18. B
19. A
20. C
21. B
22. A
23. D
24. B
25. D
26. A
27. A
28. A
29. D
30. B
31. A
32. D
33. C
34. D
35. E
36. C
37. B
38. D
39. C
40. A