TMTA
Algebra II Test
2009

1.   The Bronx Zoo charges different admission prices for senior citizens, adults, and children. If two senior citizens take their five grandchildren the total cost for admission is $31.75. If two adults take their two children the cost is $22.00. If one adult and one senior citizen, and three children visit the zoo, the admission is $24.25. What is the price if one senior citizen and one adult visit the zoo?

     a)$8.00   b)$8.50   c)$11.00   d)$12.25   e)$13.75

2.   If you graph the system $\begin{cases} x + 2y \geq 6 \\ x - y \leq 7 \\ x + 2y \leq 16 \\ x \geq 1 \end{cases}$ the system would have what geometric shape?

     a) triangle   b) rectangle   c) parallelogram   d) trapezoid   e) rhombus

3.   Charlie can paint a house in 16 hours. He hires a partner so that working together they can paint a house in 10 hours. If Charlie gets ill, how long will it take his partner to paint the house by himself?

     a) 6 hours   b)16 hours   c)$18\frac{1}{3}$ hours   d)20 hours   e)$26\frac{2}{3}$ hours

4.   Simplify: $4\sqrt{12x^3} - 5x\sqrt{27x} + 2\sqrt{75x^3}$

a)$(6 - 5x)\sqrt{87x^3 - 27x}$ b)$3x\sqrt{3x}$ c)$9x^2$ d)$2x\sqrt{15x}$ e)$21x^2\sqrt{3x}$

5.   In 1985, minimum wage was $3.35 per hour. By 2005, it reached $5.75 per hour. If minimum wage continues to grow at this same constant rate, what will it be in the year 2030?

a)$7.85 per hour   b)$8.15 per hour   c)$8.45 per hour   d)$8.75 per hour

e)$8.95 per hour

6. $\begin{bmatrix} 1 & 2 \\ 3 & m \end{bmatrix}^2 = ?$

a) $\begin{bmatrix} 7 & 4m \\ 6m & 6m^2 \end{bmatrix}$ b) $\begin{bmatrix} 6 & 4m \\ 9m & 6m^2 \end{bmatrix}$ c) $\begin{bmatrix} 1 & 4 \\ 9 & m^2 \end{bmatrix}$ d) $\begin{bmatrix} 7 & 3+3m \\ 2+2m & 6+m^2 \end{bmatrix}$ e) $\begin{bmatrix} 7 & 2+2m \\ 3+3m & 6+m^2 \end{bmatrix}$

7. A picnic cooler contains several types of soft drinks: 10 colas, 4 cherry, 6 root beer, 5 ginger ale, 3 lemon-lime, and some grape. One drink is selected at random from the cooler and the probability that it is a cola or a grape is 13/22. How many grape sodas were in the cooler?

(a) 2   (b) 8   (c) 16   (d) 13   (e) 18

8. Solve for x: $\log_{16} \dfrac{1}{x} = \dfrac{-1}{2}$

a) $x = -8$ b) $x = \dfrac{-1}{8}$ c) $x = \dfrac{1}{256}$ d) $x = \dfrac{1}{4}$ e) $x = 4$

9. What is the first digit of the 30th term in the sequence $\{5, 15, 45, 135, 405, ...\}$?
    a) 1   b) 2   c) 3   d) 4   e) 5

10. Which line is perpendicular to $8x - 6y = 5$?

   a) $3x + 4y = 2$ b) $3x - 4y = 2$ c) $8x - 6y = -5$ d) $8x + 6y = 4$ e) $6x - 8y = 5$

11. Simplify: $8i^{36} + 7i^{35} + 6i^{34} + 5i^{33}$

a)0   b) $2 - 2i$ c) $2 + 12i$ d) $14 - 2i$ e) $14 + 12i$

12. For what values of b does $y = 3x^2 + bx + b$ have no x-intercepts?

a) $b > 0$ b) $b > 12$ c) $b < 12$ d) $0 < b < 12$ d) $b < 0 \ or \ b > 12$

13. The sum of the solutions of $\sqrt{3x+1} = 1 + \sqrt{2x-1}$ is

a) 6   b) 4   c) 0   d) − 4   e) − 6

14.   Write the equation of the line that is parallel to $6x+3y=4$ and passes through the vertex of $y=2x^2-2x+3$.

a) $2x+y=7$ b) $2x-4y=-9$ c) $4x+2y=7$ d) $4x+2y=3$ e) $6x+3y=9$

15.   Find the inverse function of $y=\dfrac{3}{\sqrt{2x-4}}$.

a) $y=\dfrac{13}{2x^2}$ b) $y=\dfrac{13-x^2}{2}$ c) $y=\dfrac{9}{2x-4}$ d) $y=\dfrac{9}{2x}+2$ e) $y=\dfrac{9}{2x^2}+2$

16.   Use the properties of logarithms to combine the following into one term:
$\dfrac{1}{2}\log_5 A-3\log_5 B+\log_5 C$

a) $\dfrac{-3}{2}\log_5(ABC)$ b) $\log_5\left(\dfrac{A^{\frac{1}{2}}}{CB^3}\right)$ c) $\log_5\left(\dfrac{C\sqrt{A}}{B^3}\right)$ d) $\log_5\left(\sqrt{A}+C-B^3\right)$ e) $\log_5\left(\dfrac{AC}{-6B}\right)$

17.   Simplify: $\dfrac{(n+4)!}{(n+2)!}$

a)2   b)12   c) $n+3$ d) n^2+4n+4 e) $n^2+7n+12$

18.   If P dollars is invested in a global market for t years, it's value in the future F, is given by $F=Pe^{.08t}$. Approximately how long will it take for P to double?

a) 0.54 years   b) 1.17 years   c) 1.85 years   d) 3.22 years   e) 8.66 years

19.   Simplify: $\dfrac{\left(16x^6y^4z^2\right)^{\frac{-1}{2}}}{\left(2x^3y^2z\right)^{-2}}$

a) x^3y^2z b) $2x^2y^2z^2$ c) $\dfrac{x^3y^2z}{2}$ d) $\left(8x^2y^2z^2\right)^{\frac{1}{4}}$ e) $\left(8x^3y^2z\right)^{\frac{3}{2}}$

20.   If $npq = 12$ and $\dfrac{p}{q} = 4$, then $n = ?$

     a) $4p$ b) $\dfrac{3q}{p}$ c) $3p$ d) $\dfrac{3}{q^2}$ e) $\dfrac{pq}{12}$

21.   Suppose m and n are positive integers. If $(m+n)^2 = 49$ and $mn = 10$, then $m^2 + n^2 = ?$

     a) 25   b) 39   c) 49   d) 98   e) 29

22.   Let $A = \dfrac{1}{x}$, $B = \dfrac{x+3}{2x^2+6x}$, and $C = \dfrac{2-x}{x^2-4}$. If $x > 0$, then which of the following must be true?

a) $A > B > C$ b) $C > B > A$ c) $B > A > C$ d) $A > C > B$ e) $C > A > B$

23.   A drug to cure migraines is known to have an 80% rate of effectiveness. If a doctor prescribes the drug to four patients, what is the probability that the drug is effective for at least one of the patients?

     a) .0016   b) .0064   c) .4096   d) .5440   e) .9984

24.   If $f(x) = \dfrac{1}{x}$, what is $\dfrac{f(x+h) - f(x)}{h}$?

     a) 0   b) 1   c) $\dfrac{1}{h^2}$ d) $\dfrac{-1}{x^2+xh}$ e) $\dfrac{-h^2}{x(x+h)}$

25.   If $0 < a < b < c < 1$, then which of the following must be greater than 1?

     a) $a+b+c$ b) abc c) a^2 d) $\dfrac{c}{ab}$ e) $100c$

26. For the quadratic equation $ax^2 + bx + c = 0$, if the x-coordinate of the vertex is b, then what is the value of a?

   a) -2 b) $\dfrac{-1}{2}$ c) $\dfrac{1}{2}$ d) 1   e) 2

27. To transfer the graph of $y = 2(x-4)^2 - 5$ on top of the graph $y = 2(x-1)^2 + 1$, each point would move;

   a) up 3, right 6   b) up 6, right 3   c) up 6, left 3   d) up 3, left 6   e) down 6, right 3

28. The number of people, N affected by a disease d days after its inception is given by $N(d) = \sqrt{12d + 4}$. How long will it take for 100 people to be affected by the disease?

   a) $\dfrac{1}{2}$ days   b) 8 days   c) 35 days   d) 768 days   e) 833 days

29. Find the y-coordinate of the solution to the system $\begin{cases} y = \dfrac{3}{4-x} \\ y = \dfrac{-5}{x-8} \end{cases}$

a) $\dfrac{1}{2}$ b) $\dfrac{6}{7}$ c) $\dfrac{-3}{2}$ d) $\dfrac{5}{2}$ e) $\dfrac{6}{11}$

30. What is the maximum number of possible real solutions to the equation $ax^5 + bx^4 + cx^3 + dx^2 + ex + f = 0$, where a,b,c,d,e and f are real numbers?

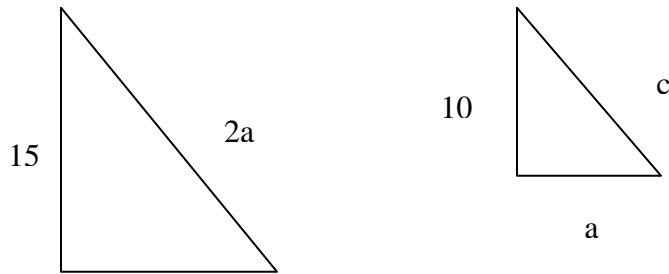   a) 1   b) 3   c) 5   d) 6   e) infinitely many

31. Which of the following functions has a domain of $x > 2$?

a) $\dfrac{1}{x-2}$ b) $\sqrt{x+2}$ c) $\dfrac{1}{\sqrt{2x-4}}$ d) $\sqrt{3x-6}$ e) $\dfrac{1}{\sqrt{4x+8}}$

32. Which set of data has the same mean, median, and mode?

a) $\{3,3,3,5\}$ b) $\{3,3,5,5\}$ c) $\{3,4,5,6\}$ d) $\{3,4,4,5\}$ e) $\{3,4,4,4\}$

33. The right triangles in the figure below are similar. Find the value of c

a) $5\sqrt{65}$ b) $\dfrac{4}{3}$ c) 20   d) $\dfrac{80}{3}$ e) $\dfrac{40\sqrt{7}}{7}$

34. Simplify the following expression: $\dfrac{2}{b}-\dfrac{b}{2}$

a) -1 b) 0   c) 2   d) $b+2$ e) $\dfrac{4-b^2}{2b}$

35. Solve: $4x^2 - 18x - 10 < 0$

a) $\dfrac{-1}{2} < x < 5$ b) $-5 < x < \dfrac{1}{2}$ c) $x < \dfrac{-1}{2}$ or $x > 5$ d) $x < -5$ or $x > \dfrac{1}{2}$

e) There are no solutions.

36. An athlete runs 4 miles in 25 minutes every day in preparation for a marathon. If she can keep this pace for the entire 26-mile marathon, how long will it take her to finish the race?

a) $2\,hrs, 22\dfrac{1}{2}\,min$ b) $2hrs, 42\dfrac{1}{2}\,min$ c) $3hrs, 12\dfrac{1}{2}\,min$ d) $3hrs, 51\,min$

e) $4hrs, 16\,min$

37. What are the vertical asymptotes for the graph: $y = \dfrac{4x+20}{x^3 + 6x^2 - x - 30}$?

a) $x = 3, x = -2$ b) $x = -5, x = -3$ c) $x = -2, x = 3, x = 5$ d) $x = -5, x = -3, x = 2$

e) $x = -3, x = 2$

38.   How far apart are the centers of the circles $(x+2)^2 + (y-5)^2 = 4$ and
$(x-4)^2 + (y+3)^2 = 9$?

a) 5   b) 10   c) 14   d) 50   e) 100

39.   Simplify the expression $\sqrt{\sqrt{256a^8 b^{12} c^{16}}}$

a) $16a^4 b^6 c^8$ b) $4a^2 b^3 c^4$ c) $4ab^{\frac{3}{2}} c^2$ d) $2ab^{\frac{3}{2}} c$ e) $64a^2 b^3 c^4$

40.   Simplify the following expression: $\dfrac{x^2 - 4}{2x - 4} \div \dfrac{x^2 + x - 2}{4x^2 + 8x - 12}$

a) $3x$ b) $\dfrac{(x-2)(4x+12)}{2x-4}$ c) $\dfrac{(x+2)^2}{(8x+24)}$ d) $2x+6$ e) $9x$