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Vero Beach Invitational March 25, 1995
Algebra II

NOTA: None Of The Above

- 1) When is $|a - b|^2$ equal to $(b - a)^2$?
a) if $a \geq b$ b) if $a \leq b$ c) always d) never e) NOTA
- 2) Find the remainder when the polynomial $x^{101} + 3x^{20} + x^3$ is divided by $x - i$.
a) $3i$ b) $3 + i$ c) $3 - 2i$ d) 3 e) NOTA
- 3) A city uses two pumps to fill its water-storage tank. The faster pump can fill the tank in 30 hours, and the slower pump requires 45 hours. If the slower pump breaks down after 8 hours, how long will it take to fill the tank?
a) 18 hours b) $21\frac{1}{5}$ hours c) $24\frac{2}{3}$ hours d) $27\frac{1}{3}$ hours e) NOTA
- 4) In a federal game preserve a herd of antelope contains two species. Species A is known to increase its population by 5% per year. Species B increases by 10% per year. An aerial survey by helicopter determines that the total number in the herd is 1200, not including 75 new offspring. What is the number of Species A in the herd?
a) 300 b) 600 c) 750 d) 900 e) NOTA
- 5) Find the distance between the points $(3\sqrt{5}, -\sqrt{13})$ and $(-\sqrt{5}, -2\sqrt{13})$
a) $\sqrt{33}$ b) $\sqrt{93}$ c) $\sqrt{137}$ d) $\sqrt{569}$ e) NOTA

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6) Find the equation of a parabola with focus at (3,0) and directrix $x = -3$.

- a) $x = \frac{1}{12}y^2$ b) $x = -\frac{1}{12}y^2$ c) $y = \frac{1}{12}x^2$ d) $y = -\frac{1}{12}x^2$ e) NOTA

7) How many integers between 5 and 318 are multiples of 4?

- a) 76 b) 77 c) 78 d) 79 e) NOTA

8) Solve for t : $\sum_{n=1}^{\infty} t^n = \frac{1}{5}$

- a) $\frac{1}{4}$ b) $\frac{1}{6}$ c) $\frac{1}{7}$ d) $\frac{1}{8}$ e) NOTA

9) Simplify: $\frac{(n+1)!}{n!}$

- a) 1 b) n c) $n - 1$ d) $n + 1$ e) NOTA

10) Solve for (x, y, z) : $\begin{bmatrix} x & z \\ 1 & y \end{bmatrix} + 2 \cdot \begin{bmatrix} 3 & z \\ 1 & y \end{bmatrix} = \begin{bmatrix} 6 & z \\ 3 & -9 \end{bmatrix}$

- a) (0,0,-3) b) (1,3,0) c) (1,3,1) d) (0,-3,0) e) NOTA

11) Find A^3 when $A = \begin{bmatrix} 0 & i \\ i & 0 \end{bmatrix}$.

- a) $\begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$ b) $\begin{bmatrix} -i & 0 \\ 0 & -i \end{bmatrix}$ c) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ d) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$ e) NOTA

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17) Solve the following system for (x,y) : $[x \ y] \begin{bmatrix} 3 \\ 4 \end{bmatrix} = [3]$

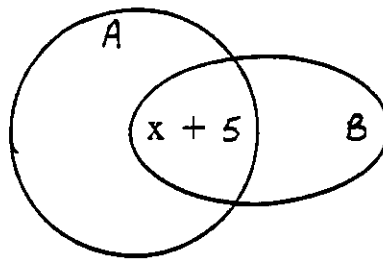
$$[4 \ -2] \begin{bmatrix} x \\ y \end{bmatrix} = [15]$$

- a) (1.6, -.5) b) (2, -.75) c) (3, -1.5) d) (5.25, 3) e) NOTA

18) What value of m makes the system inconsistent? $8x + 3 = y$
 $y - 2 = mx$

- a) -8 b) 3 c) 4 d) $5\frac{1}{3}$ e) NOTA

- 19) There are 17 elements in set A and 10 elements in set B. If $A \cup B$ contains 21 elements, what is the value of x ?



- a) 1 b) 11 c) 16 d) 22 e) NOTA

20) Suppose that $f(n) = 4 + f(n - 1)$ and that $f(1) = 12$, find $f(3)$.

- a) 6 b) 8 c) 16 d) 20 e) NOTA

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- 21) The average of three numbers is 18. If the first number is increased by five, the second number is doubled, and the third number is tripled, the average becomes 34. If the first number is decreased by five, the second number is tripled, and the third number is doubled, the average becomes 48. Find the largest of the three numbers.
- a) 18 b) 35 c) 49 d) 54 e) NOTA
- 22) If $x + \frac{1}{x} = 5$, what is the value of $x^2 + \frac{1}{x^2}$?
- a) 21 b) 23 c) 25 d) 27 e) NOTA
- 23) Suppose $\log_2 3 = a$ and $\log_2 5 = b$, what is the value of $\log_2 2.5$ in terms of a and b?
- a) $b - 1$ b) $a - b$ c) $b - a$ d) $\frac{b}{2}$ e) NOTA
- 24) Evaluate: $\sum_{k=1}^{11} (\sqrt{-1})^k$
- a) 1 b) -1 c) i d) -i e) NOTA
- 25) Chris and Josh have received walkie-talkies for Christmas. If they leave from the same point at the same time, Chris walking due north at 2.5 mph and Josh walking due east at 3 mph, how long will they be able to talk to each other if the range of the walkie-talkies is 4 miles? Round your answer to the nearest minute.
- a) 43 minutes b) 44 minutes c) 61 minutes d) 63 minutes e) NOTA

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- 26) If m varies directly as p^2 and q^4 , and p doubles while q triples, what happens to m ?
- a) 6 times larger b) 48 times larger
c) 162 times larger d) 324 times larger e) NOTA
- 27) Suppose a nuclear bomb is detonated at a certain site. The effects of the bomb will be felt over a distance from the point of detonation that is directly proportional to the cube root of the yield of the bomb. Suppose a 100-kiloton bomb has certain effects to a radius of 3 km from the point of detonation. Find the distance that the effects would be felt for a 1500-kiloton bomb.
- a) 7.4 km b) 15 km c) 30.2 km d) 45 km e) NOTA
- 28) Solve: $\frac{(5x-3)^3}{(8x-25)^2} \leq 0$
- a) $(\frac{3}{5}, 3\frac{1}{8}]$ b) $(\frac{3}{5}, \infty)$ c) $(-\infty, \frac{3}{5}]$ d) $(-\infty, 3\frac{1}{8}]$ e) NOTA
- 29) Express "x is within 4 units of 2" using absolute value notation.
- a) $|x-4| \leq 2$ b) $|x+4| \leq 2$ c) $|x-2| \leq 4$ d) $|x+2| \leq 4$ e) NOTA
- 30) Given that f is an exponential function of the form $f(x) = a^x$ and $f(3) = 4$. Find $f(-3)$.
- a) $\frac{1}{64}$ b) $\frac{1}{4}$ c) $\frac{1}{2}$ d) $2\frac{2}{3}$ e) NOTA