

2009 Algebra Hustle

1. Given  $A = \begin{bmatrix} 4 & 2 \\ 1 & -4 \end{bmatrix}$  and  $B = \begin{bmatrix} 0 & -1 \\ 3 & 2 \end{bmatrix}$ , find  $AB$ .

2. The vertex of  $y = 3x^2 - 5x + 1$  is \_\_\_\_\_.

3. Find the center of the ellipse given by the equation  $4x^2 + 9y^2 - 16x + 18y - 11 = 0$ .

4. Solve the system:  $3x - 5y = 8$

$$2x + 3y = 18$$

5. What is the radius of the circle given by the equation  $x^2 + y^2 - 10x + 5y = 2.75$ ?

6. If the pitcher always bats last and the catcher always bats fourth, how many different batting orders are possible for the Knoxville Smokies baseball team?

7. How many arrangements are there for the letters in the word **TENNESSEE**?

8. Find  $|A|$  if  $A = \begin{bmatrix} 3 & 2 & -1 \\ -2 & 0 & 4 \\ 1 & -1 & -2 \end{bmatrix}$

9. The amount of weight a beam can support varies inversely as the length of the beam and directly as the square of the width of the beam. If the length is halved and the width is doubled, by what factor does this change the amount of weight the beam can support?

10. Find the second quadrant intersection point of these two graphs.

$$y = x^2 - 2$$

$$4x + y = 1 + 2x$$

11. Simplify the expression:  $\log_2 8 + \log_3 27 + \log_4 64 + \dots + \log 1000$

12. A ball is dropped from a height of twenty feet. Each time it rebounds 75% of its previous height. How far will the ball travel before “coming to rest?”

13. Mr. Gomez needs to leave for work in 20 minutes but he is snowed in. Juan says he can shovel the driveway in 35 minutes and Rafael says he can do it in 40 minutes. If the two boys work together, can they have the driveway cleared for Mr. Gomez to leave on time? If so, how long will it take them?

14. Find all solutions to the equation below:

$$x^3 - 6x^2 - x + 30 = 0$$

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15. Solve:  $x = 2\sqrt{x} + 24$

16. Solve:  $4^{5x-2} = \left(\frac{1}{64}\right)^{7-x}$

17. Solve:  $\log_3(x+1) + \log_3(x-5) = 3$

18. Solve the system:  $\frac{3}{x} + \frac{4}{y} = 9$

$$\frac{-9}{x} + \frac{5}{y} = 7$$

19. Find the slope-intercept equation of the line through the centers of these conic sections.

$$9x^2 - 4y^2 + 18x - 12y - 36 = 0$$

$$4x^2 + 5y^2 - 16x + 20y - 4 = 0$$

20. Use the sequence 9, 4, -1, -6, ... to find the value of  $3a_{10} - 2a_{28}$ .

21. For what values of **a** and **b** will the polynomial:  $p(x) = x^3 - ax^2 + bx + 6$  give the results  $p(-1) = 0$  and  $p(3) = 72$ ?

22. Solve the system:  $3x + 2y - 6z = 16$

$$2x - 5y + 3z = 4$$

$$-x + 4y - 2z = -1$$

23. An object is fired upwards at a velocity of 64 feet per second from the top of a 100-foot tall building. Exactly when will the object hit the ground? (No decimals, please.)

24. Solve for x:  $|x + 4| \leq |2x - 1|$

25. Evaluate:  $\sum_{i=10}^{20} (40 - i)$