

1. Simplify  $\sqrt{94500}$  without a calculator.
2. Simplify  $\sqrt{\frac{108x^2y^{-3}}{x^5z^{-5}}}$  without a calculator.
3. Simplify  $\sqrt{x^2}$
4. Simplify  $\sqrt{(x-5)^2}$
5. Simplify  $81^{1/4}$
6. Solve  $x^2 - 2x - 35 = 0$  with three methods:
  - a. Factoring
  - b. Completing the Square
  - c. Quadratic Formula
7. What is the discriminant for the equation  $x^2 - 2x - 35 = 0$ , and what does it tell you?
8. Solve  $x^2 - 5x + 7 = 0$  by any method. Non-real solutions (with an  $i$  in them) are permitted. In fact, they're necessary. Can you see why? (Hint: What's the discriminant tell you?)
9. What is the domain of  $h(x) = \frac{15x+11}{x^2-7x}$ ?

10. Perform the indicated operations:

- a.  $\frac{x-3}{x+4} - \frac{x+2}{x-4}$
- b.  $\frac{x-3}{x^2-2x-35} + \frac{x+2}{x^2+6x+5}$

11. Simplify:

- a.  $\frac{-2x}{x-y}$
- b.  $\frac{y}{x^2}$
- c.  $\frac{\frac{2}{x+5} + \frac{4}{x+3}}{\frac{3x+13}{x^2+8x+15}}$
- d.  $\frac{3x^{-1} + (2x)^{-1}}{x^{-2}}$

12. Solve:

- a.  $|2x-1| = 5$
- b.  $|2x-1| = -5$
- c.  $|2x-1| > 5$
- d.  $|2x-1| > -5$
- e.  $|2x-1| < 5$
- f.  $|2x-1| < -5$

13. Divide:  $(6x^4 + x^3 - 4x + 3) \div (x^2 - 3)$ .

Write your final answer in the form  $\frac{\text{Dividend}}{\text{Divisor}} = \text{Quotient} + \frac{\text{Remainder}}{\text{Divisor}}$

14. (7 pts) Divide synthetically:  $\frac{3x^3 + 7x^2 - 4x + 12}{x+1}$ .

Write your final answer in the form  $\text{Dividend} = \text{Divisor} \cdot \text{Quotient} + \text{Remainder}$

15. (5 pts) Given  $P(x) = 3x^3 + 7x^2 - 4x + 12$ . Use the Remainder Theorem to determine  $P(-1)$ .  
Hint: Your previous work *should* come in handy, here. If you need more room, you're doing it wrong.

16. Solve  $\frac{36}{x^2 - 9} + 1 = \frac{2x}{x + 3}$

17. Two joggers, one averaging 8 mph and the other averaging 6 mph, start from the same spot and end at the same finish line. The slower jogger arrives at the end of the run a half-hour after the other jogger. Find the distance of the run.

18. An experienced roofer can roof a house in 26 hours. A beginner needs 39 hours to complete the same job. How long does it take for the two to do the job together?

19. Simplify each of the following and writing using positive exponents.

a.  $\frac{2a^{-6}b^2}{18ab^{-3}}$

b.  $\frac{(2^3 x^{-1} y^5)^2}{(6^{-2} x^2 y^{-1})^{-2}}$

c.  $2^{-2} + 3^{-1}$

20. Write each of the following in standard notation:

a.  $3.6 \times 10^{-6}$

b.  $2.3 \times 10^7$

21. Write each of the following in scientific notation:

a. 0.0000000003278

b. 1,333,564,213

22. Perform the indicated operation and simplify. Express final answer in scientific notation.

a.  $\frac{2.3 \times 10^6}{3.6 \times 10^{-3}}$

b.  $(2.3 \times 10^6)(3.6 \times 10^{-3})$

23. A Chemist has an unlimited supply of both 10% and 34% nitric acid solutions. He wants 100 liters of 21% nitric acid. How much of the 10% and 34% solutions should he mix together to accomplish this?

24. Solve the following system of linear equations by the addition method.

$$x + y = 5$$

$$4x - 3y = 6$$

25. (5 pts) **Recognition:** Write the recipe that was used to achieve the  $2^{\text{nd}}$  matrix from the first. **Interpretation:** Write the system of linear equations corresponding to the  $2^{\text{nd}}$  matrix.

$$\left[ \begin{array}{ccc|c} 1 & -3 & 2 & 21 \\ -2 & 7 & -3 & -40 \\ 3 & -9 & 7 & 68 \end{array} \right]$$

$$\left[ \begin{array}{ccc|c} 1 & -3 & 2 & 21 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & 5 \end{array} \right]$$

26. (5 pts) **Decision-Making:** Tell me what recipe *you* would apply to get to the next matrix:

$$\left[ \begin{array}{ccc|c} 1 & 3 & -1 & 6 \\ 0 & 1 & 2 & 3 \\ 0 & -1 & -1 & 1 \end{array} \right]$$

27. (5 pts bonus) **Do-it-yourself:** Find the next logical matrix in the row-reduction, with your own recipe and your own work. What is the solution of this system?

$$\left[ \begin{array}{ccc|c} 1 & 0 & 5 & 27 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & 5 \end{array} \right]$$

28. For the following problem, I'm *only* looking for the **setup**. That means:

- Define the variables in words and give the units.
- Write the system of linear equations corresponding to the problem situation.
- Write the matrix that represents the system you constructed.

29. A dietician is trying to put together her own brand of trail mix, by mixing three brands (Brand X, Brand Y, and Brand Z) of trail mix, so that *hers* will have 21 grams of fat, 50 grams of carbohydrate and 68 grams of protein per serving. The three brands of trail mix supply these according to the following table, that gives the number of grams of fat, carbs and protein per unit of each brand.

	Fat (grams)	Carbs (grams)	Protein (grams)
Brand X	2	1	7
Brand Y	4	3	4
Brand Z	1	1	3

How many units of each brand of trail mix should she use to make *her* brand of trail mix? Remember: Setup only. Don't try to solve the system, after you've built it.

30. Find an equation of the line through (1, -3) and (5, 5). Give your final answer in **point-slope form**. Hint: Use your work from #10. (Shouldn't take much room!)

31. Re-write your answer to the previous in **slope-intercept form**.

32. Re-write your answer to the previous in **function notation**

33. Re-write your answer to the previous in **standard form**.