

1. Simplify each of the following expressions.

(a) $2x^3(x^5) =$

(b) $2x^{-3}(x^5) =$

(c) $(2x)^3(x^5) =$

(d) $(2x)^{-3}(x^5) =$

(e) $(-2xy^2)^2 =$

(f) $(-2xy^{-2})^{-2} =$

(g) $(-a^2b)^3(a^4b)^2 =$

(h) $(-a^{-2}b)^{-3}(a^4b^{-1})^{-2} =$

(i) $\left(\frac{-2a^3b^{-2}}{a^5b^{-3}}\right)^{-2} =$

(j) $x(3 - 2x) - (2x - 1)^2 =$

2. Factor out the greatest common factor from each of the following polynomials.

(a) $10a^2b^2 - 6ab^3 + 2ab^2 =$

(b) $2ax^3 - ax^2 - 5ax^4 =$

(c) $4a^7b - 4a^3b + 12a^2b^2 =$

3. Factor out -1 from each of the following. Present your answer in terms organized by degree from highest to lowest.

(a) $-x^4 - 2x^7 + 3 =$

(b) $1 - 5x =$

(c) $3x + 8 - 5x^2 =$

(d) $4a - 4a^2 - 1 =$

4. Factor by grouping.

(a) $6ax - 3bx + 2ay^2 - by^2 =$

(b) $3am - an - 3bm + bn =$

(c) $2x^2 - 3x - 5 =$

5. Completely factor each of the following polynomials.

(a) $x^2 - 9 =$

(b) $6x^2 - 2x - 20 =$

(c) $-49 + 25x^2 =$

(d) $6ax^2 - 6ay^2 - 3bx^2 + 3by^2 =$

(e) $x^4 - 81 =$

(f) $5a^2bmx - 10a^2bmy + 10a^2bnx - 20a^2bny =$

(g) $1 - x^{10} =$

(h) $3a^6b - 243a^2b =$

(i) $40ax^2 + 10ax^3 - 5ax^4 =$

6. Solve each of the following equations. Make sure to check your solutions.

(a) $\frac{5x + 1}{28} + \frac{12x - 6}{56} = \frac{x - 1}{14}$

(b) $b^3 = 4b^2$

(c) $b^3 = 9b$

(d) $2(x - 3) - \frac{x}{2} = \frac{3}{2}(x - 4)$

(e) $2x^2 - 32x = 0$

7. Solve the following system of linear equations.

$$\begin{cases} x + 2y = 4 \\ 2x - y = -17 \end{cases}$$

8. Linear Word Problems.

(a) Julia is 5 years younger than her brother, Tom. How old are they if the sum of their ages is 43?

(b) One side of a rectangle is 6 in shorter than the other side. Find the sides of the rectangle if its perimeter is 120 in.

(c) One side of a rectangle is 6 in shorter than **twice** the other side. Find the sides of the rectangle if its perimeter is 120 in.

(d) The largest angle in a triangle is three times as large as the smallest angle. The middle angle is 35° larger than the smallest angle. Find the angles in the triangle.

(e) The sum of two numbers is 27. Their difference is 11. Find these numbers.

9. Quadratic Word Problems

- (a) The product of two numbers is 65. Their difference is 8. Find these numbers.
- (b) If we square a number, we get six times the number. Find all numbers with this property.
- (c) If we raise a number to the third power, we get four times the number. Find all numbers with this property.

10. Word Problems solvable by systems of linear equations.

- (a) There is a farm where chickens and cows live. There are 79 heads and 262 legs. How many chickens, how many cows?
- (b) We invested \$ 5000 in two bank accounts. One account earns 5% interest per year, the other earns 8% interest per year. How much did we invest into each account if the combined interest of the two accounts was \$ 337 after one year?