Solving Multi-Step Equations

1. Clear parentheses using the distributive property.

2. Combine like terms within each side of the equal sign.

3. Add/subtract terms to both sides of the equation to get the terms with variables on one side and constant terms on the other side.

4. Isolate the variable by multiplying/dividing both sides of the equation by the number with the variable.

Ex: $3(2x - 5) - 3 = 2x + 8 + 6x$

$6x - 15 - 3 = 2x + 8 + 6x$

$6x - 18 = 8x + 8$
$ \underline{-8} \underline{-8}$
$6x - 26 = 8x$
$\underline{-6x} \underline{-6x}$
$\dfrac{-26}{2} = \dfrac{2x}{2}$

$-13 = x \rightarrow \boxed{x = -13}$

Finding Slope from 2 Points

Slope Formula: $m = \dfrac{y_2 - y_1}{x_2 - x_1}$

Special Cases:

$\dfrac{0}{\#} \rightarrow$ slope = 0 $\dfrac{\#}{0} \rightarrow$ slope is undefined

Ex: Find the slope of the line that passes through the points (-9, -3) and (7, -7)

$m = \dfrac{-7 - (-3)}{7 - (-9)} = \dfrac{-4}{16} = \boxed{-\dfrac{1}{4}}$

Slope-Intercept Form

$y = mx + b$
  $m = slope$ & $b = y$-intercept

Graphing from Slope-Intercept Form:

1. Make a point at the y-intercept.
2. Use the slope $\left(\dfrac{rise}{run}\right)$ to make more points.
3. Connect the points to form a line.

Ex: Graph $y = \dfrac{2}{3}x - 1$
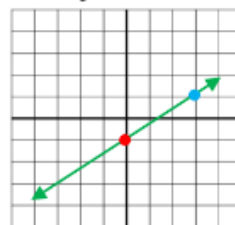
y-intercept is -1
slope = $\dfrac{2}{3}$, (so from the y-intercept go up 2 & right 3)

Standard Form

$Ax + By = C$
  $A, B,$ & C are integers & A is not negative

Graphing Using Intercepts:

1. Find the x-intercept by substituting 0 for y.
2. Find the y-intercept by substituting 0 for x.
3. Make a point at each intercept and then connect the points to form a line.

Ex: Graph $2x - 3y = -6$
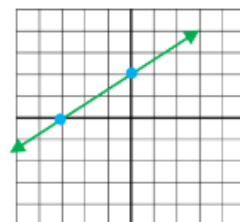
x-intercept: $2x - 3(0) = -6$
$2x = -6 \rightarrow x = -3$
$(-3, 0)$

y-intercept: $2(0) - 3y = -6$
$-3y = -6 \rightarrow y = 2$
$(0, 2)$

Exponent Rules

<u>Zero Exponent</u>: Any base raised to the zero power equals 1.

<u>Negative Exponent</u>: Move the base to the opposite side of the fraction bar and make the exponent positive.

<u>Monomial x Monomial</u>: Multiply the coefficients and add the exponents of like bases.

<u>Monomial ÷ Monomial</u>: Divide the coefficients and subtract the exponents of like bases.

<u>Power of a Monomial</u>: Raise each base (including the coefficient) to that power. If a base already has an exponent, multiply the two exponents.

<u>Power of a Quotient</u>: Raise each base (including the coefficients) to that power. If a base already has an exponent, multiply the two exponents.

Ex: $(-9)^0 = \boxed{1}$

Ex: $3^{-4} = \frac{1}{3^4} = \boxed{\frac{1}{81}}$

Ex: $(-2x^3)(8x^{-5}) = -16x^{-2} = \boxed{\frac{-16}{x^2}}$

Ex: $\frac{4ab^3}{4a^2b^2} = 1a^{-1}b^1 = \boxed{\frac{b}{a}}$

Ex: $(3x^3y^2)^3 = 3^3x^9y^6 = \boxed{27x^9y^6}$

Ex: $\left(\frac{5a^3b}{2c^{-1}}\right)^2 = \frac{5^2a^6b^2}{2^2c^{-2}} = \boxed{\frac{25a^6b^2c^2}{4}}$

Factoring Out a GCF

1. Find the largest monomial that is a factor of each term in the polynomial, and pull it out in front of parentheses.

2. Divide each term by the GCF and write the resulting polynomial in the parentheses.

Ex: Factor $25x^4y - 30x^3y^2 + 10x^2y^3$

GCF = $5x^2y$, so divide each term by $5x^2y$

→ $\boxed{5x^2y(5x^2 - 6xy + 2y^2)}$

Factoring Binomials

First factor out a GCF if there is one. Then determine whether it is a difference of squares binomial (in the form $a^2 - b^2$). If it is, use the method below.

<u>Binomials in the form $a^2 - b^2$</u>

1. Find the square root of the first term (a) and the square root of the second term (b). Your answer will be $(a + b)(a - b)$.

Ex: Factor $16x^2 - 25$

The square root of $16x^2 = 4x$ & the squre root of $25 = 5$

→ $\boxed{(4x + 5)(4x - 5)}$

Factoring Trinomials

First factor out a GCF if there is one. Then use the appropriate method below, depending on whether or not the leading coefficient is 1.

<u>Trinomials in the form $x^2 + bx + c$ (leading coefficient = 1)</u>

1. Find two numbers with a product of c and a sum of b.

2. Your answer will be written as the product of two binomials: (x + 1st number)(x + 2nd number).

Ex: Factor $x^2 - 6x + 8$

Need 2 numbers with product of 8 and sum of -6.
→ the 2 numbers are -4 & -2

→ (x + -4)(x + -2) → $\boxed{(x - 4)(x - 2)}$

Answers to

1) $\{1\}$ 2) $\{-8\}$ 3) $\{-5\}$ 4) $\{-6\}$

5) $\{-5\}$ 6) $\{-5\}$ 7) $\{7\}$ 8) $\{7\}$

9) $\{-2\}$

10) $\left\{-\dfrac{9}{8}\right\}$ 11) $\left\{\dfrac{45}{8}\right\}$ 12) $\{6\}$

13) $\left\{\dfrac{23}{3}\right\}$ 14) $\left\{\dfrac{77}{5}\right\}$ 15) $\left\{\dfrac{6}{35}\right\}$ 16) $\left\{\dfrac{107}{3}\right\}$

17) $\{-18\}$ 18) $\{17\}$ 19) $\{-10\}$ 20) $\{-4\}$

21) $4x^7$ 22) $16a^7$ 23) n^6 24) $4v^6$

25) $\dfrac{2n^2}{3}$ 26) 4 27) $-4m^6$ 28) $4m$

29) $3(2v+9)$ 30) $9n^2(8n-1)$ 31) $9y^3(y^2+2x)$ 32) $4(x^4y-1)$

33) $2x(3+5x-4x^4)$ 34) $9(1+x^3-x)$ 35) $(m+8)(m+10)$ 36) $(x+6)(x-8)$

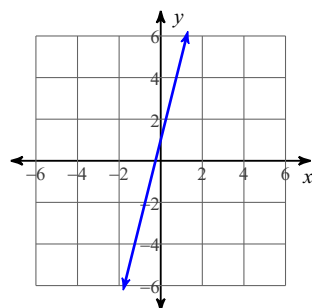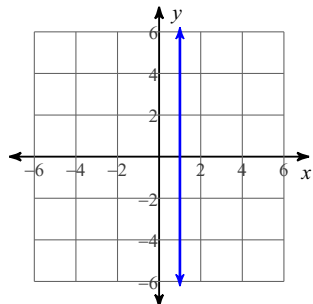37) $(n+6)(n+3)$ 38) $(x-3)(x-1)$ 39) $(n+9)(n-2)$ 40) $(n-2)(n+2)$
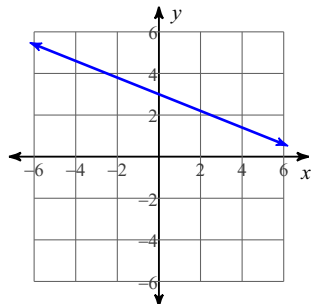
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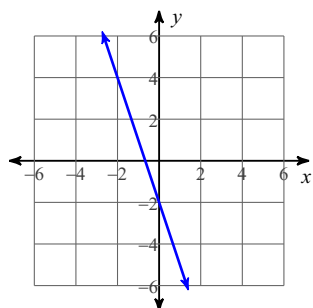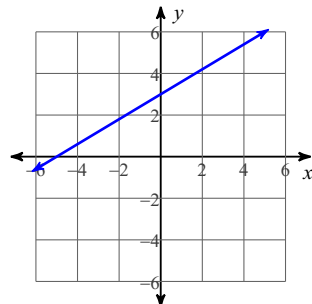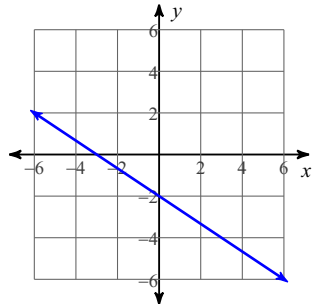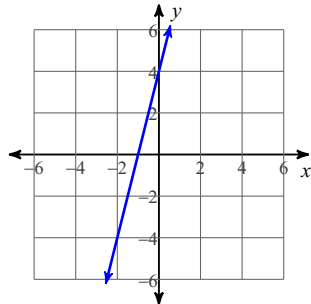

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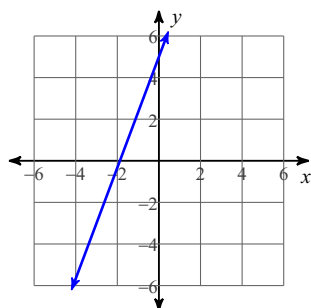
43)

44)

45)

46)

47)

48)

49) Undefined

50) 0 51) $\dfrac{4}{5}$ 52) -2 53) $-\dfrac{3}{2}$

54) $-\dfrac{2}{5}$ 55) 0 56) 3