

College Algebra Pre-Test Key

Follow the directions below to answer each question. Show all work.

1. Expand the following:

a) $(x + 2)(x^2 - 2x + 4)$

$$\begin{aligned}(x + 2)(x^2 - 2x + 4) &= x^3 + 2x^2 - 2x^2 - 4x + 4x + 8 \\ &= x^3 + 8\end{aligned}$$

b) $(2x - 3)^2$

$$(2x - 3)^2 = 4x^2 - 12x + 9$$

2. Simplify, leave all exponents positive.

a) $(2x^2)^3\left(\frac{x^5}{x^9}\right)$

$$\begin{aligned}(2x^2)^3\left(\frac{x^5}{x^9}\right) &= (8x^6)\left(\frac{1}{x^4}\right) \\ &= 8x^2\end{aligned}$$

b) $(3x)^{-2}(9x^8)$

$$\begin{aligned}(3x)^{-2}(9x^8) &= \left(\frac{1}{9x^2}\right)(9x^8) \\ &= x^6\end{aligned}$$

3. Simplify, follow the order of operations. No answers should contain complex fractions.

a) $(x - 3)(x + 3) - (x + 3)^2$

$$\begin{aligned}(x - 3)(x + 3) - (x + 3)^2 &= (x^2 - 9) - (x^2 + 6x + 9) \\ &= x^2 - 9 - x^2 - 6x - 9 \\ &= -6x - 18\end{aligned}$$

b) $\frac{2x + 7}{4x - 3} + \frac{x + 3}{x - 4}$

$$\begin{aligned}\frac{2x + 7}{4x - 3} + \frac{x + 3}{x - 4} &= \frac{(2x + 7)(x - 4)}{(4x - 3)(x - 4)} + \frac{(x + 3)(4x - 3)}{(4x - 3)(x - 4)} \\ &= \frac{2x^2 - x - 28}{(4x - 3)(x - 4)} + \frac{4x^2 + 9x - 9}{(4x - 3)(x - 4)} \\ &= \frac{(2x^2 - x - 28) + (4x^2 + 9x - 9)}{(4x - 3)(x - 4)} \\ &= \frac{6x^2 + 8x - 37}{(4x - 3)(x - 4)}\end{aligned}$$

c) $\frac{\frac{2x + 3}{x - 5}}{\frac{x + 7}{x}}$

$$\begin{aligned}\frac{\frac{2x + 3}{x - 5}}{\frac{x + 7}{x}} &= \frac{2x + 3}{x - 5} \cdot \frac{x(x - 5)}{x(x + 7)} \\ &= \frac{x(2x + 3)}{(x + 7)(x - 5)}\end{aligned}$$

4. Factor the following polynomials

a) $x^2 - 5x + 6$

$$x^2 - 5x + 6 = (x - 2)(x - 3)$$

b) $2x^2 + 5x - 12$

$$2x^2 + 5x - 12 = (2x - 3)(x + 4)$$

c) $3x^3 - 12x$

$$\begin{aligned}3x^3 - 12x &= 3x(x^2 - 4) \\ &= 3x(x - 2)(x + 2)\end{aligned}$$

5. Solve each of the following equations for all values of x. Use symbolic methods and give exact solutions.

a) $8x + 5 = x + 3$

$$8x + 5 = x + 3$$

$$7x = -2$$

$$x = -\frac{2}{7}$$

b) $\frac{2}{3}(4x + 7) + 3 = \frac{1}{5}(7x - 2)$

$$\frac{2}{3}(4x + 7) + 3 = \frac{1}{5}(7x - 2)$$

$$15\left(\frac{2}{3}(4x + 7) + 3\right) = 15\left(\frac{1}{5}(7x - 2)\right)$$

$$10(4x + 7) + 45 = 3(7x - 2)$$

$$40x + 70 + 45 = 21x - 6$$

$$40x + 115 = 21x - 6$$

$$19x = -121$$

$$x = -\frac{121}{19}$$

c) $yx + 3y = 4x - 2$

$$yx + 3y = 4x - 2$$

$$3y = 4x - 2 - yx$$

$$3y + 2 = 4x - yx$$

$$3y + 2 = x(4 - y)$$

$$x = \frac{3y + 2}{4 - y}$$

d) $(3x + 2)(x - 4) = 0$

$$(3x + 2)(x - 4) = 0$$

$$3x + 2 = 0 \text{ or } x - 4 = 0$$

$$3x = -2 \text{ or } x = 4$$

$$x = -\frac{2}{3} \text{ or } x = 4$$

e) $x^2 + 2x + 5 = 0$

$$x^2 + 2x + 5 = 0$$

$$x = \frac{-2 \pm \sqrt{4 - 20}}{2}$$

$$x = \frac{-2 \pm \sqrt{-16}}{2}$$

$$x = \frac{-2 \pm 4i}{2}$$

$$x = -1 \pm 2i$$

f) $\sqrt{2x + 1} = x - 1$

$$\sqrt{2x + 1} = x - 1$$

$$(\sqrt{2x + 1})^2 = (x - 1)^2$$

$$2x + 1 = x^2 - 2x + 1$$

$$x^2 - 4x = 0$$

$$x(x - 4) = 0$$

$$x = 0 \text{ or } x = 4$$

6. Let $2x + 3y = 6$

a) Solve the equation for y and state the slope and y -intercept.

$$2x + 3y = 6$$

The slope is $-\frac{2}{3}$ and the y -intercept is $(0, 2)$

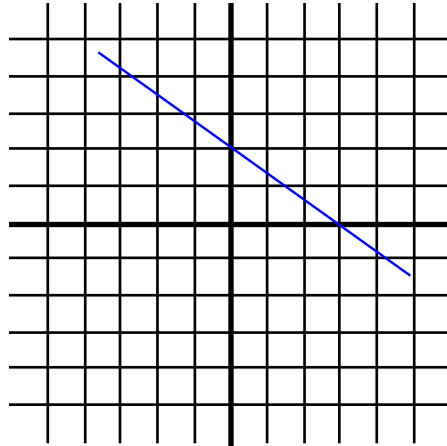
$$3y = -2x + 6$$

$$y = -\frac{2}{3}x + 2$$

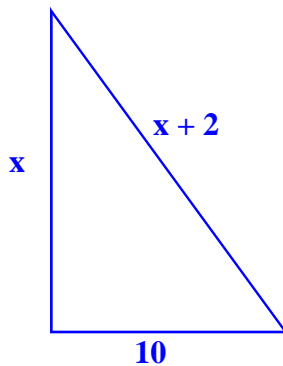
b) Determine the x -intercept.

Set $y = 0$ and solve for x . $2x = 6$, $x = 3$. The x -intercept is $(3, 0)$.

c) Sketch the graph.



7. A ladder is leaning against a wall so that the foot of the ladder is 10 feet from the base of the wall. The ladder is 2 feet longer than the height it reaches up the wall. How far up the wall does the ladder reach?



Using Pythagorean Theorem:

$$10^2 + x^2 = (x + 2)^2$$

$$100 + x^2 = x^2 + 4x + 4$$

$$96 = 4x$$

$$x = 24$$

The ladder reaches 24 feet up the wall.