

1. Simplify each of the following. Show all steps.

$$(a) \frac{x^3 - x}{x + 1} = x^2 - x \quad (6.3 \text{ Example 4})$$

$$(b) \frac{\sqrt{8} - \sqrt{5}}{\sqrt{8} + \sqrt{5}} = \frac{13 - 4\sqrt{10}}{3} \quad (9.5 \text{ Example 10})$$

$$(c) \left(-\frac{x^3 y^0 x^{-5}}{y^{-3}} \right)^{-2} = \frac{x^4}{y^6} \quad (4.2 \text{ Example 3})$$

$$(d) (\sqrt{5x} - 2)(\sqrt{5x} + 3) = 5x + \sqrt{5x} - 6 \quad (9.5 \text{ Example 4})$$

$$(e) \frac{x^2 - 10x + 25}{x^2 - 5x + 4} \left(\frac{x^2 - 2x - 8}{x^2 - 6x + 5} \div \frac{x - 5}{x - 1} \right) = \frac{x + 2}{x - 1} \quad (6.4 \text{ Example 10})$$

2. Factor completely each of the following expressions.

$$(a) 3a^4x - 48x = 3x(a^2 + 4)(a + 2)(a - 2) \quad (7.4 \text{ Example 7})$$

$$(b) 21x^2 - 18ax^2 - 3a^2x^2 = -3x^2(a + 7)(a - 1) \quad (5.3 \text{ Example 8})$$

3. Solve each of the following equations. Make sure to check your solution(s).

$$(a) \frac{3x + 17}{2} = x - 1 + \frac{x + 19}{2} \quad \text{identity, all numbers are solution} \quad (2.3 \text{ Exercise 83})$$

$$(b) |3 - 2x| + 2 = 5 \quad 0, 3 \quad (7.2 \text{ Example 4})$$

$$(c) \frac{2}{3}(x - 7) = \frac{4}{5}(x + 1) \quad -41 \quad (7.1 \text{ Example 8})$$

$$(d) \sqrt{5x - 6} + 2 = 2x \quad 2, \frac{5}{4} \quad (9.6 \text{ Example 3})$$

$$(e) 7x^2 + (x + 3)(2x - 1) = (3x + 1)^2 \quad -4 \quad (4.6 \text{ Example 7})$$

4. Graph the straight lines $3x + 5y = -1$ and $y = -x - 1$ in the same coordinate system.

(a) Use your graph to find the coordinates of the point where the lines intersect. (8.1 Example 1, 3) $(-2, 1)$

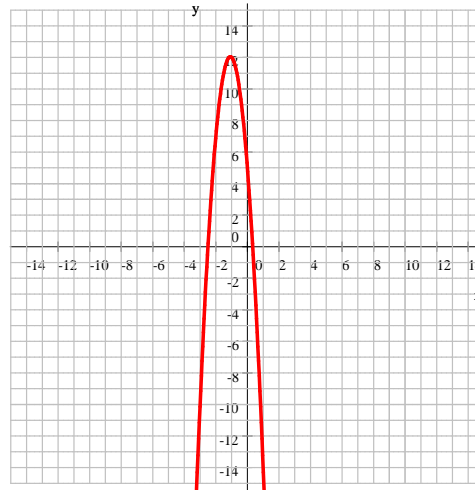
(b) Use algebraic methods of checking your solution.

Solution: We substitute $x = -2$ and $y = 1$ into both equations.

$$\begin{aligned} 1 &= -(-2) - 1 && \implies (-2, 1) \text{ is on the line } y = -x - 1 \\ 3(-2) + 5(1) &= -6 + 5 = -1 && \implies (-2, 1) \text{ is on the line } 3x + 5y = -1 \end{aligned}$$

Thus the point $(-2, 1)$ is on both lines.

5. Graph the parabola $y = 5 - 6x^2 - 13x$. Clearly label the coordinates of five points on the parabola, including vertex and intercepts. (8.5 Exercise 40)



6. There is an animal farm where chickens and cows live. All together, there are 53 heads and 174 legs. How many chickens, how many cows? **19 chickens and 34 cows**
7. The area of a rectangle is 1260 m^2 . Find the dimensions of the rectangle if we know that one side is 48 m longer than three times the other side. **14 m by 90 m**
8. Chicago, IL and Paris, TX are about 875 miles apart. A car leaves Chicago to Paris at the same time as a train leaves Paris for Chicago. The train is $41 \frac{\text{mi}}{\text{hr}}$ faster than the car. Find the speed of the train if it takes 5 hours until the train and car meet. **$108 \frac{\text{mi}}{\text{h}}$**
9. We invested \$10000 into two bank accounts. One account earns 14% per year, the other account earns 8% per year. How much did we invest into each account if the combined interest from the two accounts is \$1238 after the first year? **\$ 7300 at 14% and \$ 2700 at 8%**