

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

$$\begin{array}{lll} \text{a) } \frac{x^3 - x}{x + 1} & \text{c) } \left(-\frac{x^3 y^0 x^{-5}}{y^{-3}}\right)^{-2} & \text{e) } \frac{x^2 - 10x + 25}{x^2 - 5x + 4} \left(\frac{x^2 - 2x - 8}{x^2 - 6x + 5} \div \frac{x - 5}{x - 1}\right) \\ \text{b) } \frac{\sqrt{8} - \sqrt{5}}{\sqrt{8} + \sqrt{5}} & \text{d) } (\sqrt{5x} - 2)(\sqrt{5x} + 3) & \text{f) } \frac{x^2 + 3x - 13}{x^2 - x - 2} - \frac{5}{x + 1} \end{array}$$

2. Factor completely each of the following expressions.

$$\text{a) } 3a^4x - 48x \qquad \text{b) } 21x^2 - 18ax^2 - 3a^2x^2$$

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

$$\begin{array}{lll} \text{a) } \frac{3x + 17}{2} = x - 1 + \frac{x + 19}{2} & \text{c) } \frac{2}{3}(x - 7) = \frac{4}{5}(x + 1) & \text{e) } 3x^2 - 30x + 69 = 0 \\ \text{b) } |3 - 2x| + 2 = 5 & \text{d) } 7x^2 - (2x - 1)^2 - 1 = 2(x + 1)^2 & \end{array}$$

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

- Use your graph to find the coordinates of the point where the lines intersect.
- Use algebraic methods of checking your solution.

5. Write an equation for the line that is

- parallel to  $2x - 3y = 6$  and passes through the point  $P(-12, -5)$ .
- perpendicular to  $2x - 3y = 6$  and passes through the point  $P(-12, -5)$ .
- passes through the points  $(-8, 3)$  and  $(-12, -5)$ .

6. Compute the distance between the points  $(-3, 7)$  and  $(2, -3)$ .

7. Graph the parabola  $y = -6x + x^2 + 5$ . Clearly label the coordinates of five points on the parabola, including vertex and intercepts.

8. a) 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?

b) The area of a rectangle is  $1260 \text{ m}^2$ . Find the dimensions of the rectangle if we know that one side is 48 m longer than three times the other side.

c) 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?

d) Ann started to walk southbound in the morning, with a rate of  $120 \frac{\text{ft}}{\text{min}}$  (feet per minute). Ten minutes later, Betty followed her with a rate of  $150 \frac{\text{ft}}{\text{min}}$ . How long will it take for Betty to catch up with Ann?

e) How much of each of a 15% and a 7% solution should be mixed to obtain 24 liters of a solution that is 10%?

f) The shortest side of a right triangle is 12 feet long. The difference between the other two sides is 2 feet. Find the sides of the triangle.

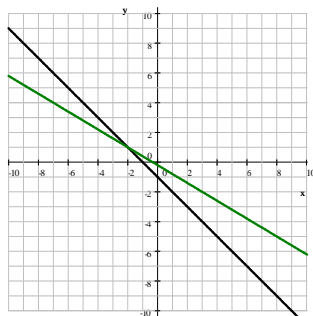
## Answers

1. a)  $x^2 - x$     b)  $\frac{13 - 4\sqrt{10}}{3}$     c)  $\frac{x^4}{y^6}$     d)  $5x + \sqrt{5x} - 6$     e)  $\frac{x+2}{x-1}$     f)  $\frac{x-3}{x-2}$

2. a)  $3x(a^2 + 4)(a + 2)(a - 2)$     b)  $-3x^2(a + 7)(a - 1)$

3. a) identity, all numbers are solution    b) 0, 3    c) -41    d) 2, -2    e)  $5 \pm \sqrt{2}$

4. a)  $(-2, 1)$



b) We substitute  $x = -2$  and  $y = 1$  into both equations.

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

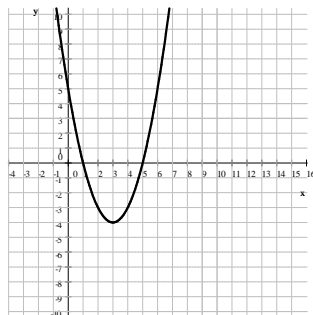
Thus the point  $(-2, 1)$  is on both lines, so it is a point of intersection.

5. a)  $2x - 3y = -9$  or  $y = \frac{2}{3}x + 3$  or  $y + 5 = \frac{2}{3}(x + 12)$

b)  $3x + 2y = -26$  or  $y = -\frac{3}{2}x - 13$  or  $y + 5 = -\frac{3}{2}(x + 12)$

c)  $y = 2x + 19$  or  $y + 5 = 2(x + 12)$  or  $y - 3 = 2(x + 8)$

6.



7.  $\sqrt{125} = 5\sqrt{5}$

8. a) 19 chickens and 34 cows    b) 14 m by 90 m    c) \$7300 at 14% and \$2700 at 8%

d) 40 minutes    e) 9 liters of 15% and 15 liters of 7%    f) 12 ft, 35 ft, 37 ft