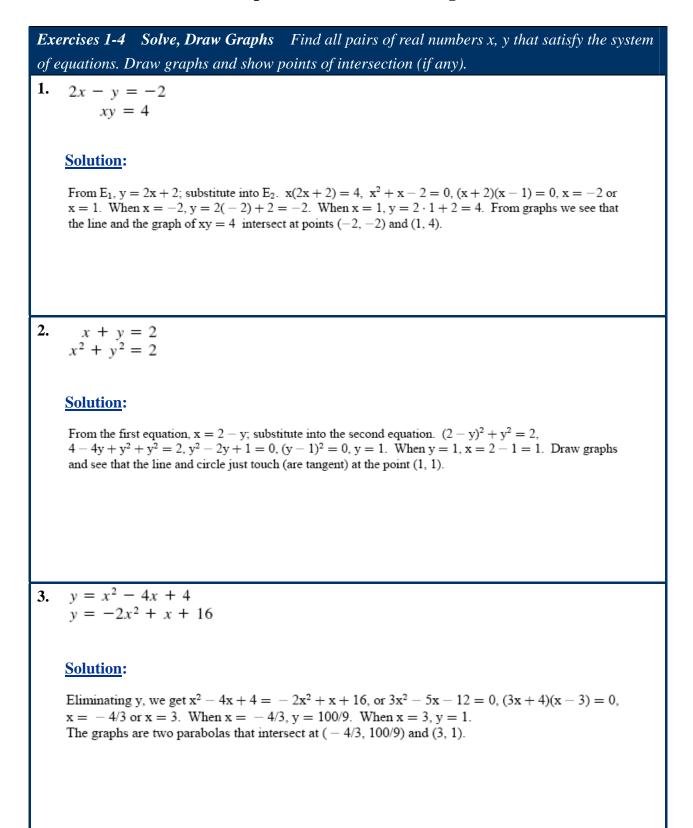
## Chapter 9.3 Homework Page



4. 2x - y = 0xy - y = 2

## Solution:

From E<sub>1</sub>, y = 2x; substitute into E<sub>2</sub>. x(2x) - 2x = 2, x<sup>2</sup> - x - 1 = 0, x =  $(1 \pm \sqrt{5})/2$ . When  $x_1 = (1 + \sqrt{5})/2 \approx 1.62$ ,  $y = 2x_1 = 1 + \sqrt{5} \approx 3.24$ . When  $x_2 = (1 - \sqrt{5})/2 \approx -0.62$ ,  $y = 2x_2 = 1 - \sqrt{5} \approx -1.24$ . Draw graphs and see that the line and the rational function, y = 2/(x - 1), intersect at approximately (1.62, 3.24) and (-0.62, -1.24).

*Exercises 5-6 Nonlinear Systems Solve the system of equations. If results involve irrational numbers, give approximations rounded off to two decimal places.* 

 $y = e^x$  $x + \ln y = 0$ 

## **Solution**:

5.

From  $E_2$ ,  $x = -\ln y$ ; substitute into  $E_1$ .  $y = e^{-\ln y}$ ,  $y = e^{\ln y^{-1}}$ ,  $y = y^{-1}$ , y = 1/y,  $y^2 = 1$ . Therefore, y = 1 or y = -1. When y = 1,  $x = -\ln 1 = 0$ . When y = -1,  $x = -\ln(-1)$ , undefined. Therefore, there is only one solution, (0, 1).

6.  $3^x + 3y = 10$  $3^{x-1} - y = 8$ 

#### **Solution:**

From E<sub>2</sub>,  $y = 3^{x-1} - 8$ ; substitute into E<sub>1</sub>.  $3^x + 3(3^{x-1} - 8) = 10$ ,  $3^x + 3^x - 24 = 10$ ,  $2 \cdot 3^x = 34$ ,  $3^x = 17$ ,  $\ln 3^x = \ln 17$ ,  $x \ln 3 = \ln 17$ ,  $x = \ln 17/\ln 3 \approx 2.58$ . When  $x \approx 2.58$ ,  $y = 3^{x-1} - 8 \approx 3^{1.58} - 8 \approx -2.33$ . Therefore, there is only one solution, (2.58, -2.33).

# **Exercises 7** Rectangles

 Find the dimensions of a rectangle that has a diagonal of length 13 cm and a perimeter of 34 cm.

## **Solution:**

Let x, y be the dimensions of the rectangle with diagonal 13 cm:  $\sqrt{x^2 + y^2} = 13$ . Perimeter is 34 cm: 2x + 2y = 34. Therefore, we want solutions to the system of equations  $x^2 + y^2 = 169$ , x + y = 17. Solving we get x = 5, y = 12 or x = 12, y = 5. Therefore, the rectangle is 5 cm  $\times$  12 cm.