

Name: _____

AK

System of Equations

Solve each equation using substitution. Be sure to write solution(s) as an ordered pair (x,y).

1. $y - 5 = \log x + 5$
 $y = 6 - \log(x - 3)$

$\log x + 5 = 6 - \log(x - 3)$
 $\log(x - 3) + \log x = 1$
 $\log(x - 3)x = 1$
 $10 = x^2 - 3x$
 $x^2 - 3x - 10 = 0$
 $(x - 5)(x + 2) = 0$
 $x = 5, -2$
 $(5, \log 5 + 5)$

2. $y - 9 = e^{2x}$
 $3 = y - 7e^x$

$y = e^{2x} + 9$
 $y = 7e^x + 3$
 $e^{2x} + 9 = 7e^x + 3$
 $e^{2x} - 7e^x + 6 = 0$
 $(e^x - 1)(e^x - 6) = 0$
 $e^x = 1$ $e^x = 6$
 $x = \ln 1$ $x = \ln 6$
 $(1, 10)$
 $3 + 7e^{\ln 6} = y$
 $3 + 7e^{\ln 6} = y$
 $3 + 42 = y$
 $45 = y$
 $(6, 45)$

3. $x^3 - y = 2x$
 $y = 5x - 6$
 $y - 5x = -6$

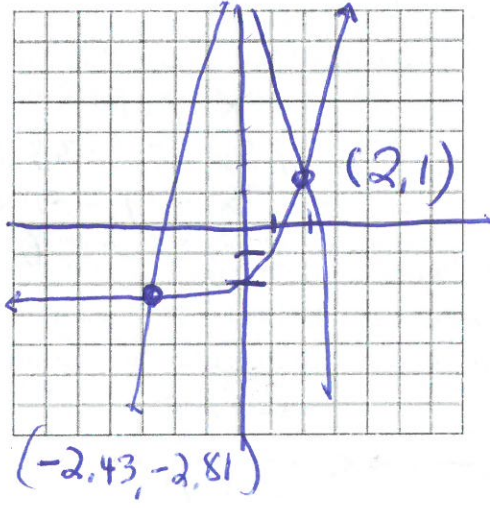
$x^3 - 2x = 5x - 6$
 $x^3 - 7x + 6 = 0$
 $(x - 1)(x^2 + x - 6)$
 $(x - 1)(x + 3)(x - 2) = 0$
 $(1, -1)$ $(-3, -21)$ $(2, 4)$

4. $y = -2 - x$
 $x + y = -2$
 $y + 4x = x^2$

$-2 - x + 4x = x^2$
 $x^2 - 3x + 2 = 0$
 $(x - 1)(x - 2) = 0$
 $(1, -3)$ $(2, -4)$

Solve each equation using a graphing calculator. Draw a sketch of each system and identify the solutions.

5. $y = 2^x - 3$
 $y + 2x^2 = 9$

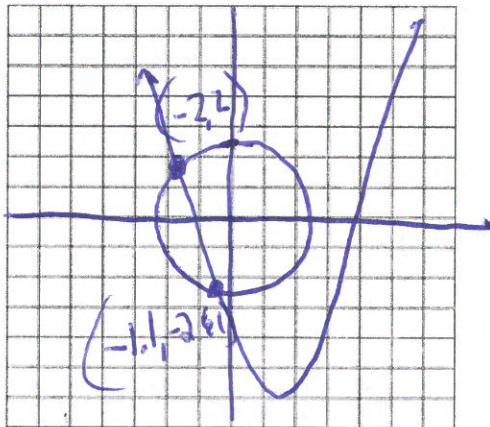


$$y = x^2 - 2x - 6 = (x-1)^2 - 7$$

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

$$6. \quad \frac{5x^2}{5} + \frac{5y^2}{5} = \frac{40}{5}$$

$$x^2 + y^2 = 8$$



7. The price of a single black and white copy varied significantly. Suppose the cost to produce these copies is modeled by the function $C(x) = 0.1x^2 - 1.2x + 7$, where $C(x)$ represents the cost to produce x hundred thousand copies. If the revenue from the sales of these copies is modeled by $R(x) = -0.1x^2 + 1.8x - 2$, find the amount of copies sold which will cause the company to break even.

$$P = R - C$$

$$-0.1x^2 + 1.8x - 2 - (0.1x^2 - 1.2x + 7) = 3x - 9 = 0 \quad x = 3$$

8. A large American flag has an area of 85m^2 and a perimeter of 37m . Find the dimensions of the flag

$$2w + 2l = 37$$

$$w = \frac{37 - 2l}{2}$$

$$A = l \left(\frac{37 - 2l}{2} \right) = 85$$

$$l = 8.5 \times 10$$

9. At a local concert, 1435 tickets were sold. A student admission ticket cost \$1.50 and an adult admission ticket cost \$5.00. The total receipts for the concert were \$3552.50. How many of each ticket were sold?

$$x + y = 1435$$

$$1.5x + 5y = 3552.5$$

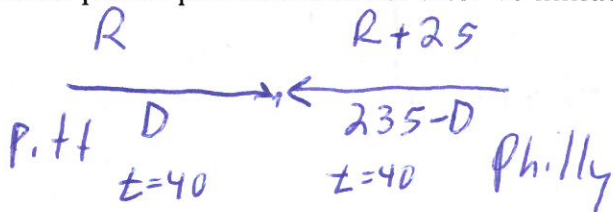
$$-5x - 5y = -7175$$

$$-3.5x = -722.5$$

$$x = 1035$$

$$y = 400$$

10. Two planes leave Pittsburgh and Philadelphia at the same time, each going to the other city. One plane flies 25 mph faster than the other. Find the air speed of each plane if the cities are 275 miles apart and the planes pass one another after 40 minutes of flying time.



$$D_{\text{Pitt}} + D_{\text{Philly}} = 275$$

$$R \left(\frac{2}{3} \right) + (R + 25) \left(\frac{2}{3} \right) = 275$$

$$\frac{4}{3}R + \frac{50}{3} = 275$$

$$R = 103.75$$

$$R = 128.75$$