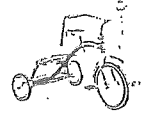




# Another Look at Trike Wars



Discovering another method to find solutions from yesterday.

Yesterday one of our solutions was hard to see exactly. Which one was that?

Why couldn't we find the solution exactly?

What was our guess?

What facts do we know about this system?

Any ideas of how we could solve this system another way besides graphing?

Solving systems of equations by Substitution.

The Substitution Method: A way to solve a linear system in which a variable in one equation is isolated. Then, the expression that the variable equals is substituted in to the other equation.

Solving one of the trike wars systems by substitution: Let's start with one we know the answer to already.

Punky vs. Howard

$$y = \frac{5}{2}x + 6$$

$$y = 5x - 10$$

$(\frac{5x}{2} + 6 = 5x - 10) \cdot 2$

$$\frac{10x}{2} + 12 = 10x - 20$$

5x + 12		10x - 20
-5x		-5x
12		-20
+20		+20
32		5x
3		5
6.4 = x		
		sol

$y = 5x - 10$   
 $= 5(6.4) - 10$   
 $= 32 - 10$   
 $y = 22$

(6.4, 22)  
 sol pt

### Steps to Solving a Linear System by Substitution

1. IF NOT ALREADY, GET A VARIABLE ALONE IN ONE EQUATION.
2. ONCE VARIABLE IS ALONE, SUBSTITUTE THE EXPRESSION IT IS EQUAL TO INTO THE OTHER EQUATION FOR THAT SAME VARIABLE.
3. YOU SHOULD NOW HAVE ONE EQUATION THAT HAS ONLY ONE VARIABLE IN IT: SOLVE FOR IT.
4. ONCE A VALUE IS FOUND, SUBSTITUTE IT INTO EITHER EQUATION TO SOLVE FOR OTHER VARIABLE.
5. EXPRESS AS AN ORDERED PAIR: (x,y)
6. Check ✓

Now lets try the one we didn't know the answer to exactly:

How close was our guess from yesterday?

Solve the system of linear equations by substitution. Check your answer and state the type of system.

1)  $y = -3x - 3$

$-2x + y = 7$

$y = -3x - 3$

$-2x + y = 7$

$-2x + (-3x - 3) = 7$

$-2x - 3x - 3 = 7$

$-5x - 3 = 7$

$+3 \quad +3$

$-5x = 10$

$\frac{-5x}{-5} = \frac{10}{-5}$

$x = -2$

$y = -3x - 3$

$= -3(-2) - 3$

$= 6 - 3$

$y = 3$

$(-2, 3)$   
x y

Type:

CONSISTENT, INDEPENDENT

Check:

$y = -3x - 3$

$3 = -3(-2) - 3$

$= 6 - 3$

$3 = 3$

✓

$-2x + y = 7$

$-2(-2) + 3 = 7$

$4 + 3 = 7$

$7 = 7$

✓

2)  $y = 2x + 3$

$x = -4$

$x = -4$

$y = 2x + 3$

$y = 2(-4) + 3$

$= -8 + 3$

$= -5$

$(-4, -5)$

Type:

CONSISTENT, INDEPENDENT

Check:

3)  $x - 3y = 9$   
 $x + 4y = 2$

4)  $5x - 3y = 22$   
 $-4x + y = -19$

Type:

Check:

Type:

Check:

Solving special linear systems by substitution. Check your answer and state the type of system.

1)  $x + y = 3$

$-4x - 4y = 12$

$x + y = 3$   
 $-y -y$

$x = 3 - y$

$-4x - 4y = 12$

$-4(3 - y) - 4y = 12$

$-12 + 4y - 4y = 12$

NOT A TRUE STATEMENT, SO

$\Rightarrow -12 = 12$

NO SOLUTION = PARALLEL LINES

Type: INCONSISTENT

Check:

X

2)  $3x - 3y = -15$

$-x + y = 5$

$3x - 3y = -15$

$3x - 3(x + 5) = -15$

$3x - 3x - 15 = -15$

$-15 = -15 \iff$  ALWAYS TRUE - (NO VARIABLES)

SAME LINE: INFINITE SOLUTIONS

Type:

CONSISTENT, DEPENDENT

Check:

X

Solve the real-world situation by using substitution.

A cable television provider has a \$55 setup fee and charges \$82 per month. A different cable provider has \$160 setup fee and charges \$67 a month.



- a) Identify your variables.  $m = \text{months}$   
 $C = \text{TOTAL COST}$

- b) Write the system of equations that can be used to represent this situation.

	CABLE A	CABLE B
$C =$	$82m + 55$	$67m + 160$

- c) In how many months will both providers cost the same? What will the cost be?

$$\begin{array}{r}
 82m + 55 = 67m + 160 \\
 -55 \qquad \qquad -55 \\
 \hline
 82m = 67m + 105 \\
 -67m \qquad \qquad -67m \\
 \hline
 15m = 105 \\
 \frac{15m}{15} = \frac{105}{15}
 \end{array}$$

$$m = 7 \text{ months}$$

- d) If you plan to move in 12 months, which provider would be less expensive? Explain.

Before 7 months, A is cheaper.  
 After 7 months, B is cheaper.

### Ticket out the Door

What do you like about solving a system by the substitution method? What do you dislike?