

## Monitoring Sheet: Please reflect on your week!

	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
<b>Monday</b> Date: <u>9/18</u> Topic: <u>Movie Ticket Analysis</u>	0 1 2	
<b>Tuesday</b> Date: <u>9/19</u> Topic: <u>HowOld.net Analysis</u>	0 1 2	
<b>Wednesday</b> Date: <u>9/20</u> Topic: <u>No homework - yesterday was a quiz.</u>	0 1 2	
<b>Thursday</b> Date: <u>9/21</u> Topic: <u>Pre-read 19A</u>	0 1 2	
<b>Friday</b> Date: <u>9/22</u> Topic: <u>19A Graphing Systems of Equations</u>	0 1 2	

HAPPY FRIDAY!



## Warm-up:

How can we find what  $y$  is equal to? How can we envision the two lines crossing?

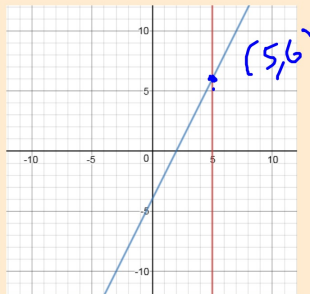
$$x = 5$$

$$y = 2x - 4$$

$$y = 2(5) - 4$$

$$y = 10 - 4$$

$$y = 6 \quad (5, 6)$$



## Class Plan

1. Warm-up
2. 19B Substitution
3. Joke Break :)
4. Practice

Unit 1 Linear  
(Part 2) **Chapter** **19**

**Simultaneous** \*Systems of  
**equations** Equations\*

Contents:

- A Graphical solution **Yesterday**
- B Solution by substitution
- C Solution by elimination
- D Problem solving
- E Non-linear simultaneous equations

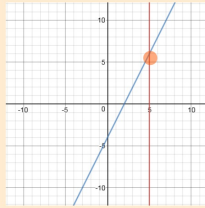
Today: 19B Solution by Substitution

# Unit 1 Linear

## \*Systems of Equations\*

We will use multiple methods to solve for an x and y values ----

that satisfy both equations!  
(a point that is on both lines!)



## System of Equations:

2 equations with 2 variables.

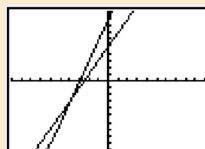
$$y = 2x + 5$$

$$y = 3x + 9$$

Methods of Solving Systems:

ALGEBRA

GRAPH



TABLE

	P1ot2	P1ot3
V1	2x+5	
V2	3x+9	
V3		
V4		
V5		
V6		
V7		
Equation		
X	Y1	Y2
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

SYMBOLIC MANIPULATION

- 1) Substitution
- 2) Elimination

## What does substitution mean?

B

### SOLUTION BY SUBSTITUTION

We will now consider some **algebraic** methods for solving simultaneous equations.

The method of **solution by substitution** is used when at least one equation is given with either  $x$  or  $y$  as the **subject** of the formula. We substitute an expression for this variable into the other equation.

\*When at least 1 eqn. is given with  $x/y$  as the subject\*

#### Example 3

 Self Tutor

Solve simultaneously by substitution: 
$$\begin{cases} y = x + 5 \\ 3x - y = 1 \end{cases}$$

B

Chapter 19

### SOLUTION BY SUBSTITUTION

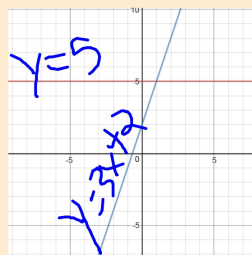
#### Example 1:

$$\begin{aligned} y &= 5 && (1, 5) \\ y &= 3x + 2 \end{aligned}$$

$$\begin{array}{r} 3x + 2 = 5 \\ \underline{-2 \quad -2} \\ 3x = 3 \end{array}$$

$$\frac{3x}{3} = \frac{3}{3}$$

$$\boxed{x = 1}$$



**Example 2:**

$$y = x + 3$$

$$y = 3x + 1$$

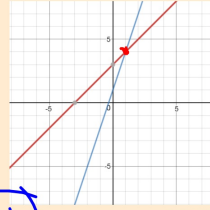
$$x + 3 = 3x + 1$$

$$\begin{array}{r} x + 3 = 3x + 1 \\ -x \quad -x \\ \hline 3 = 2x + 1 \\ -1 \quad -1 \\ \hline 2 = 2x \\ \frac{2}{2} = \frac{2x}{2} \end{array}$$

$$x = 1$$

$$y = 1 + 3$$

$$y = 4$$

 $(1, 4)$ 

## Self Tutor

$$\text{tution: } \begin{cases} y = x + 5 \\ 3x - y = 1 \end{cases}$$

$$y = x + 5$$

$$3x - y = 1$$

$$3x - (x + 5) = 1$$

$$3x - x - 5 = 1$$

$$\quad \quad +5 \quad | +5$$

$$3x - x = 6$$

$$y = 3 + 5$$

$$y = 8$$

$$\begin{array}{l} x \\ y \end{array} \downarrow \downarrow$$

$$(3, 8)$$

$$\frac{2x}{2} = \frac{6}{2} \quad x = 3$$

**Example 3****Solution**

Solve simultaneously by substitution: 
$$\begin{cases} y = x + 5 \\ 3x - y = 1 \end{cases}$$

$$y = x + 5 \quad \dots (1)$$
$$3x - y = 1 \quad \dots (2)$$

Substituting (1) into (2) gives  $3x - (x + 5) = 1$

$$\therefore 3x - x - 5 = 1$$
$$\therefore 2x = 6$$
$$\therefore x = 3$$

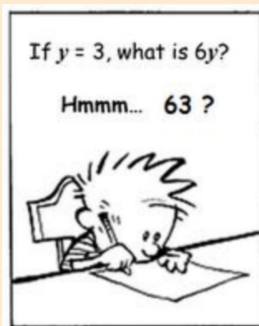
Substituting  $x = 3$  into (1) gives  $y = 3 + 5$

$$\therefore y = 8$$

The solution is  $x = 3, y = 8$ .

Check: In (1):  $8 = 3 + 5$  ✓  
In (2):  $3(3) - 8 = 9 - 8 = 1$  ✓

We substitute  $(x + 5)$   
for  $y$  in equation (2).

**Joke Break :)**

**What is the  
correct  
answer?**

Exercises... 19B  
Pages 377 - 378

**B** Chapter 19 **SOLUTION BY SUBSTITUTION**

#1 (choose 2), #2 (choose 2),  
#3 (choose 2), #4, #5

**B** Chapter 19 **SOLUTION BY SUBSTITUTION**

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Exercises... 19B

**EXERCISE 19B** Show us 1a! Pages 377 - 378

1 Solve simultaneously by substitution:

$$\text{a } \begin{cases} y = x - 3 \\ 2x + 3y = 26 \end{cases} \quad x = 7$$

**B Chapter 19 SOLUTION BY SUBSTITUTION****#1 (choose 2), #2 (choose 2),  
#3 (choose 2), #4, #5** Exercises... 19B  
Pages 377 - 378**EXERCISE 19B****1** Solve simultaneously by substitution:

**a** 
$$\begin{cases} y = x - 3 \\ 2x + 3y = 26 \end{cases}$$

**b** 
$$\begin{cases} y = 3x - 2 \\ 5x - 2y = 5 \end{cases}$$

**c** 
$$\begin{cases} 7x + 4y = -7 \\ y = 8 - 5x \end{cases}$$

**d** 
$$\begin{cases} y = 2x - 12 \\ y = 13 - 3x \end{cases}$$

**e** 
$$\begin{cases} y = 3x + 4 \\ 5x + 3y = 5 \end{cases}$$

**f** 
$$\begin{cases} 5x - 6y = 2 \\ y = 3 - 7x \end{cases}$$

**2** Solve simultaneously by substitution:

**a** 
$$\begin{cases} x = y + 9 \\ 5x + 2y = 10 \end{cases}$$

**b** 
$$\begin{cases} 7x - 5y = 1 \\ x = 2y + 4 \end{cases}$$

**c** 
$$\begin{cases} x = 2y - 7 \\ x = 13 - 6y \end{cases}$$

**d** 
$$\begin{cases} y = 2x - 2 \\ x = 5y + 7 \end{cases}$$

**e** 
$$\begin{cases} 2x + 4y = 1 \\ x = 10y - 7 \end{cases}$$

**f** 
$$\begin{cases} x = -4y - 3 \\ 9x + 5y = 2 \end{cases}$$

**B Chapter 19 SOLUTION BY SUBSTITUTION****Exercises: 19B****3** Solve simultaneously by substitution:

**a** 
$$\begin{cases} y = \frac{1}{2}x - 2 \\ 3x - 8y = 11 \end{cases}$$

**b** 
$$\begin{cases} x = -\frac{2}{3}y \\ 6x + 7y = 6 \end{cases}$$

**c** 
$$\begin{cases} 5x - 12y = 18 \\ y = \frac{1}{4}x - 1 \end{cases}$$

**d** 
$$\begin{cases} y = -\frac{1}{2}x - 1 \\ 4x + 3y = -2 \end{cases}$$

**e** 
$$\begin{cases} 2x - 3y = 3 \\ x = \frac{11}{5}y + 2 \end{cases}$$

**f** 
$$\begin{cases} 14x + 15y = 25 \\ y = \frac{2}{5}x - 3 \end{cases}$$

**4 a** Try to solve by substitution: 
$$\begin{cases} y = 3x + 1 \\ 9x - 3y = 5 \end{cases}$$
**b** What is the simultaneous solution for the equations in **a**?**5 a** Try to solve by substitution: 
$$\begin{cases} y = 3x + 1 \\ 6x - 2y = -2 \end{cases}$$
**b** How many simultaneous solutions do the equations in **a** have?



## Solutions

4 b no solutions

5 b infinitely many solutions

## EXERCISE 19B

1 a  $x = 7, y = 4$

c  $x = 3, y = -7$

e  $x = -\frac{1}{2}, y = \frac{5}{2}$

2 a  $x = 4, y = -5$

c  $x = -2, y = \frac{5}{2}$

e  $x = -\frac{3}{4}, y = \frac{5}{8}$

3 a  $x = 5, y = \frac{1}{2}$

c  $x = 3, y = -\frac{1}{4}$

e  $x = \frac{3}{7}, y = -\frac{5}{7}$

b  $x = -1, y = -5$

d  $x = 5, y = -2$

f  $x = \frac{20}{47}, y = \frac{1}{47}$

b  $x = -2, y = -3$

d  $x = \frac{1}{3}, y = -\frac{4}{3}$

f  $x = \frac{23}{31}, y = -\frac{29}{31}$

b  $x = -\frac{4}{3}, y = 2$

d  $x = \frac{2}{5}, y = -\frac{6}{5}$

f  $x = \frac{7}{2}, y = -\frac{8}{5}$