

MINDS ON...

Question 1:

Graph the two lines to determine the point of intersection:

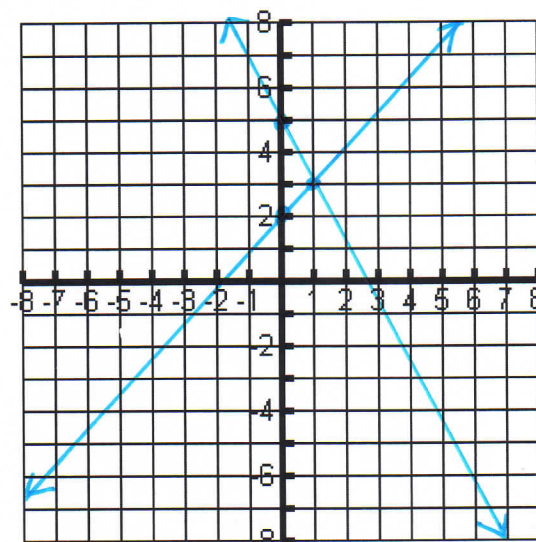
$$y = x + 2 \quad \textcircled{1}$$

$$y = -2x + 5 \quad \textcircled{2}$$

The point of intersection is (1, 3)

Check by substituting coordinates into both equations. Do they balance?

$y = x + 2$		$y = -2x + 5$	
<u>LS</u>	<u>RS</u>	<u>LS</u>	<u>RS</u>
y	$x + 2$	y	$-2x + 5$
$= 3$	$= 1 + 2$	$= 3$	$= -2(1) + 5$
	$= 3$		$= -2 + 5$
			$= 3$



Question 2:

Two online music providers are offering special memberships. Citrus Wire charges a monthly fee of \$20 plus \$1.00 for each song. Ear Bud charges a \$10 monthly fee plus \$2.00 per song. Let n represent the number of songs and C represents the total cost for the month.

Citrus Wire: $C = n + 20$
(represented by solid line)

Ear Bud: $C = 2n + 10$
(represented by dashed line)

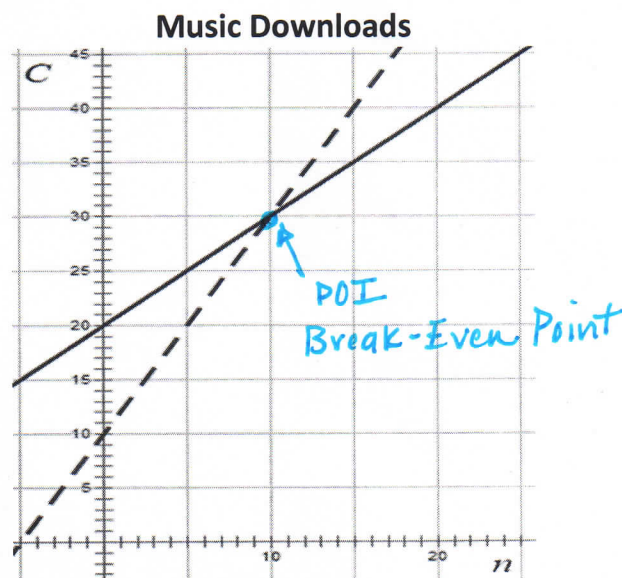
a) Point of Intersection (P.O.I.): (10, 30)

b) Interpretation of the point: When you buy 10 songs, the cost is the same (\$30) for both music providers.

c) If you download less than 10 songs, choose Ear Bud.

If you download more than 10 songs, choose Citrus Wire.

If you download 10 songs, choose either company and the cost is \$30 (the same)



Finding the point of intersection is also called...

- the solution
- the "Break Even" point

Linear Systems: Solving by Substitution

Date Notes

EXAMPLE 1: Solving Linear Systems by SUBSTITUTION

<p>STEP 1: Make sure at least one equation is in the form "y =" or "x =" and number your equations.</p> <p>BOTH equations are in this form.</p>	<p>Given:</p> $y = -x - 6 \quad \textcircled{1}$ $y = 3x + 10 \quad \textcircled{2}$						
<p>STEP 2: Substitute one equation into the other...</p>	<p>Sub $\textcircled{1}$ into $\textcircled{2}$</p> $-x - 6 = 3x + 10$						
<p>STEP 3: Solve the resulting equation. <i>Solve for x</i></p>	$-6 - 10 = 3x + x$ $-16 = 4x$ $\frac{-16}{4} = \frac{4x}{4}$ $\boxed{-4 = x}$						
<p>STEP 4: Substitute the value found for the one variable into either equation to find the other variable.</p>	<p>Sub $x = -4$ into $\textcircled{1}$</p> $y = -x - 6$ $y = -(-4) - 6$ $y = 4 - 6$ $\boxed{y = -2}$						
<p>STEP 5: State the point of intersection</p>	<p>\therefore POI is $(-4, -2)$</p>						
<p>Check your solution in both original equations</p>							
<p>Check in (1) $y = -x - 6$</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>LS</p> $y = -2 \checkmark$ </td> <td style="width: 50%; vertical-align: top;"> <p>RS</p> $= -x - 6$ $= -(-4) - 6$ $= 4 - 6$ $= -2 \checkmark$ </td> </tr> </table>		<p>LS</p> $y = -2 \checkmark$	<p>RS</p> $= -x - 6$ $= -(-4) - 6$ $= 4 - 6$ $= -2 \checkmark$	<p>Check in (2) $y = 3x + 10$</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>LS</p> $y = -2 \checkmark$ </td> <td style="width: 50%; vertical-align: top;"> <p>RS</p> $= 3x + 10$ $= 3(-4) + 10$ $= -12 + 10$ $= -2 \checkmark$ </td> </tr> </table>		<p>LS</p> $y = -2 \checkmark$	<p>RS</p> $= 3x + 10$ $= 3(-4) + 10$ $= -12 + 10$ $= -2 \checkmark$
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<p>LS</p> $y = -2 \checkmark$	<p>RS</p> $= 3x + 10$ $= 3(-4) + 10$ $= -12 + 10$ $= -2 \checkmark$						

Linear Systems: Solving by Substitution

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EXAMPLE 2: Solving Linear Systems by SUBSTITUTION

<p>STEP 1: Make sure at least one equation is in the form "y =" or "x =" and number your equations.</p> <p>ONLY equation #2 is in this form.</p>	<p>Given:</p> $3x + 2y = 1 \quad \textcircled{1}$ $y = -x + 3 \quad \textcircled{2}$				
<p>STEP 2: Substitute one into the other...</p>	<p>Sub $\textcircled{2}$ into $\textcircled{1}$</p> $3x + 2(-x + 3) = 1$				
<p>STEP 3: Solve the resulting equation.</p>	$3x - 2x + 6 = 1$ $x + 6 = 1$ $x = 1 - 6$ $x = -5$				
<p>STEP 4: Substitute the value found for the one variable into either equation to find the other variable.</p>	<p>Sub. $x = -5$ into $\textcircled{2}$</p> $y = -x + 3$ $y = -(-5) + 3$ $y = 5 + 3$ $y = 8$				
<p>STEP 5: State the point of intersection</p>	<p>$(-5, 8)$</p>				
<p>Check your solution in both original equations</p>					
<p style="text-align: center;">Check in (1) $3x + 2y = 1$</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>LS</p> $= 3x + 2y$ $= 3(-5) + 2(8)$ $= -15 + 16$ $= 1 \checkmark$ </td> <td style="width: 50%; vertical-align: top;"> <p>RS</p> $= 1 \checkmark$ </td> </tr> </table>	<p>LS</p> $= 3x + 2y$ $= 3(-5) + 2(8)$ $= -15 + 16$ $= 1 \checkmark$	<p>RS</p> $= 1 \checkmark$	<p style="text-align: center;">Check in (2) $y = -x + 3$</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>LS</p> $= y$ $= 8 \checkmark$ </td> <td style="width: 50%; vertical-align: top;"> <p>RS</p> $= -x + 3$ $= -(-5) + 3$ $= 5 + 3$ $= 8 \checkmark$ </td> </tr> </table>	<p>LS</p> $= y$ $= 8 \checkmark$	<p>RS</p> $= -x + 3$ $= -(-5) + 3$ $= 5 + 3$ $= 8 \checkmark$
<p>LS</p> $= 3x + 2y$ $= 3(-5) + 2(8)$ $= -15 + 16$ $= 1 \checkmark$	<p>RS</p> $= 1 \checkmark$				
<p>LS</p> $= y$ $= 8 \checkmark$	<p>RS</p> $= -x + 3$ $= -(-5) + 3$ $= 5 + 3$ $= 8 \checkmark$				