1.3 Equivalent Linear Systems

DO IT NOW!

Solve using substitution:

\[ 6x + 5y = 7 \]
\[ x - y = 3 \]

Steps to Substitution

1. Isolate a variable (choose the easiest one).
2. Substitute this expression into the second equation.
3. Combine like terms (remember order of operations).
4. Solve for the variable.
5. Substitute that value into one of the original equations and solve for the second variable.

Answer:

(2, -1)
1.3 Equivalent Linear Relations and Equivalent Linear Systems

Investigation:

a) On the same grid, graph the lines $x + 2y = 4$ and $2x + 4y = 8$

b) How are the graphs related?

c) When solving the system using substitution, what answer do you get?

d) How are the equations related?

Start by re-arranging the equations in slope y-intercept form so that you can graph them.

What do you notice:

- The graphs are the same. The lines are __________________________

- The two equations are ______________________

**Equivalent Linear Equations**: Equations that have the same graph

Note: For any linear equation, an equivalent linear equation can be written by multiplying the equation by any real number.
1.3 Equivalent linear systems (student copy)

**Equivalent Linear Systems Investigation**

- For the next 15 minutes you will work with the person beside you to complete the equivalent linear systems investigation.
- This is a good chance to practice your graphing skills!

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**Equivalent Linear Systems Findings**

Equivalent linear systems can be written by:

1) __________________________________________
   __________________________________________
   __________________________________________

2) __________________________________________
   __________________________________________
   __________________________________________

Equivalent linear systems have the same solution. The graphs of the linear relations in the system have the same point of intersection.

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**Example 1:** Which two of the following are equivalent linear equations

- $y - x + 5 = 0$
- $2y = 2x - 10$
- $y = 3x + 15$

**Example 2:**

Write an Equivalent Linear System by Adding and Subtracting the Original Equations

- $3x + y = 19$
- $4x - y = 2$
- $3x + y = 19$
- $4x - y = 2$
Check to make sure the linear systems are equivalent:

<table>
<thead>
<tr>
<th>ORIGINAL</th>
<th>NEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3x + y = 19$</td>
<td>$7x = 21$</td>
</tr>
<tr>
<td>$4x - y = 2$</td>
<td>$2y - x = 17$</td>
</tr>
</tbody>
</table>

Review of What we Learned

Equivalent Linear Equations: Equations that have the same graph

Note: For any linear equation, an equivalent linear equation can be written by multiplying the equation by any real number.

Equivalent linear systems have the same solution. The graphs of the linear relations in the system have the same point of intersection.

Equivalent linear systems can be written by:
1) multiplying the equation by any real number
2) adding or subtracting the original equations

Homework:
Pg. 32 # 1,2,3,6,7,8