Unit 6: Lesson 04

Converting linear functions to y = mx + b form
Verifying solutions of linear equations

A shortcut:

When we solve an equation like y + 2= 3x for y we add -2 to both sides as follows:

$$y + \cancel{2} - \cancel{2} = 3x - 2$$
$$y = 3x - 2$$

Notice that the original +2 eventually shows up on the other side of the equation as -2. This leads to a new shortcut rule:

Any term of an equation can be **moved to the opposite side** of the equation if its **sign is reversed**.

Just remember this shortcut (sometimes called transposing) is **really adding or subtracting** a quantity to/from both sides.

Example 1: Solve y + 5 = x for y.

$$y + 5 = x$$
$$\boxed{y = x - 5}$$

Example 2: Solve y – 4x = 2 for y.

$$y - 4x = 2$$
$$\boxed{y = 4x + 2}$$

Notice that the linear equation y = mx + b has "*y* by itself on the left side." This means *y* "has been solved for."

Many times linear equations are encountered that are not in y = mx + b form. **Convert to y = mx + b** form by simply **solving for *y***.

Example 3: Convert 5x = 7 + 2y to y = mx + b form.

$5x = 7 + 2y$

$-2y = -5x + 7$

$\frac{-2y}{-2} = \frac{-5x}{-2} + \frac{7}{-2}$

$\boxed{y = \frac{5}{2}x - \frac{7}{2}}$

Example 4: Convert x + y – 11 = 0 to y = mx + b form.

$x + y - 11 = 0$

$\boxed{y = -x + 11}$

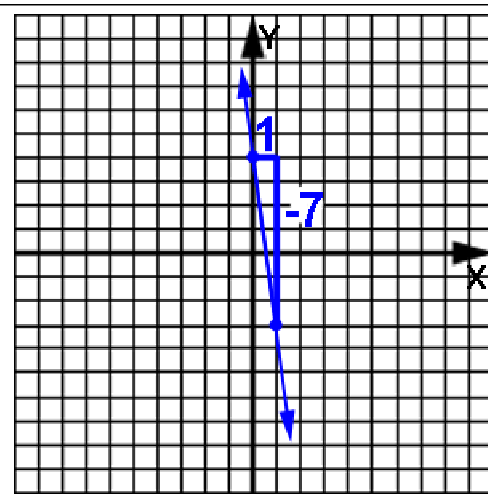
Example 5: Graph the linear function given by 7x + y – 4 = 0.

$7x + y - 4 = 0$

$y = -7x + 4$

$y = mx + b$

$m = -7 \quad b = 4$



How can we know if any particular **point lies on a line**?

Obviously, we could plot the point, graph the line, and by a visual inspection, observe if the point is on the line.

> If the line and point are far away from each other, this technique works fine; however, what if they were very close? In that case it would be difficult to tell if the point was really on the line or not.

We need a better technique:

> **Substitute the coordinates for the point into the equation** for the line. If the equation is "**satisfied**", the point is on the line.

Example 6: Determine if the point (2, -5) is on the line given by:

$y + 3x - 7 = 0$

$y + 3x - 7 = 0$

$-5 + 3(2) - 7 = 0$

$-5 + 6 - 7 = 0$

$-1 - 7 = 0$

$-8 \neq 0$

$\boxed{\text{No, not on the line}}$

Example 7: Determine if the point (2, 1) satisfies this equation:

$y + 3x - 7 = 0$

$y + 3x - 7 = 0$

$1 + 3(2) - 7 = 0$

$1 + 6 - 7 = 0$

$7 - 7 = 0$

$0 = 0$ ✓

$\boxed{\text{yes it's satisfied}}$

Assignment:

1. Solve $4x + 3 = 2x$.

2. Solve $8p - 9q + p = 4$ for p.

3. Put $x + y + 2 = 0$ in slope-intercept form.

4. Put $4x - 9y = 11$ in $y = mx + b$ form.

5. Convert $(3/4)y + (1/2)x + 12 = 0$ to $y = mx + b$ form.

6. Put $x = y$ in slope intercept form.

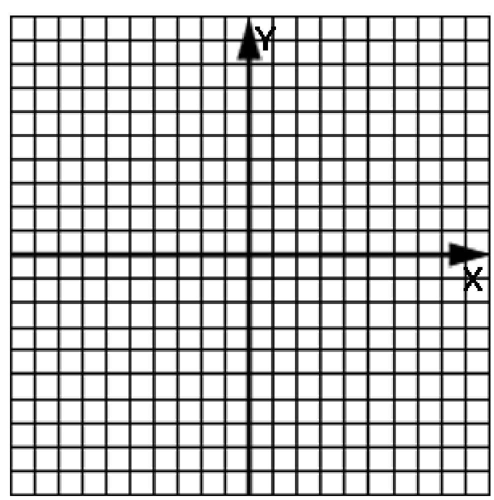
7. What is the slope of the line whose equation is y + x – 4 = 0?

8. What is the y-intercept of the line whose equation is 22x – 5y = 1?

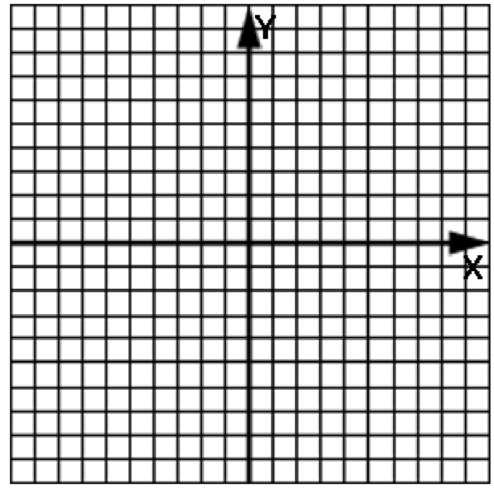
9. Where does 4 – 8x = f(x) cross the vertical axis?

10. If the points (3, -18) and (0, 6) are two points on a line, what is the y-intercept of the line?

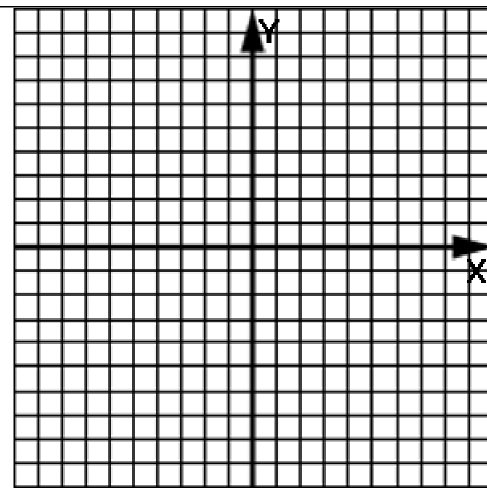
11. Graph the line given by the equation 4 = y – x + 1.



12. Graph the line given by $4x + 5y = 15$



*13. Graph the line whose slope is -2 and whose y-intercept is four less than the y-intercept of the linear function given by $y + x - 11 = 0$.



14. Determine if the point (2, -5) is on the line given by: $f(x) = 5x + 1$

15. Is (6, 1) a solution to the equation $2x + 5y = 17$?

16. Does the graph of the function given by $f(x) = 2x$ pass through the origin?

17. Does the point $(-8, 2)$ lie on the graph of $3x + 5y = -14$?