AP Calculus AB — Worksheet 1 - Lines — Name:

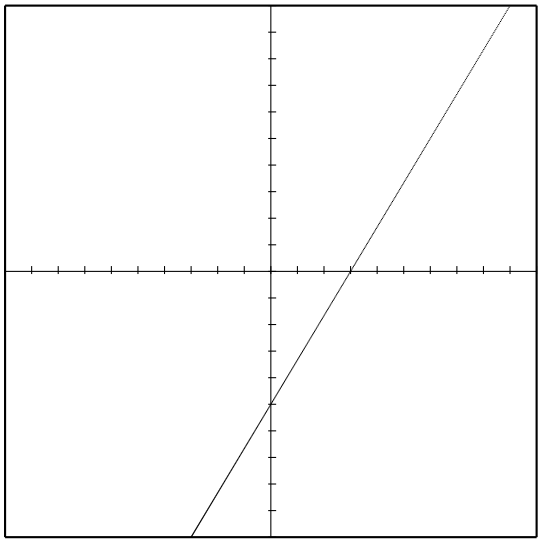
Dr. Paul L. Bailey — Thursday, October 27, 2022

Every vertical line can be expressed by a unique equation of the form $x = c$, where c is a constant. Such lines have undefined slope (or, one may say that the slope is ∞).

Every other line has can be expressed by a unique equation of the form $y = mx + b$. This is called *slope-intercept form*, where m is the slope and b is the y-value of the y intercept.

Example 1. Consider the graph of a line. Find the standard form ($y = mx + b$) of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line.

Solution. By examining the graph, we see that the y-intercept of the line is $(0, -5)$ and that the x-intercept is $(3, 0)$. The slope is the change in y divided by the change in x, which is $\frac{5}{3}$. Thus $m = \frac{5}{3}$ and $b = -5$. □



Standard Form: $y = \frac{5}{3}x - 5$

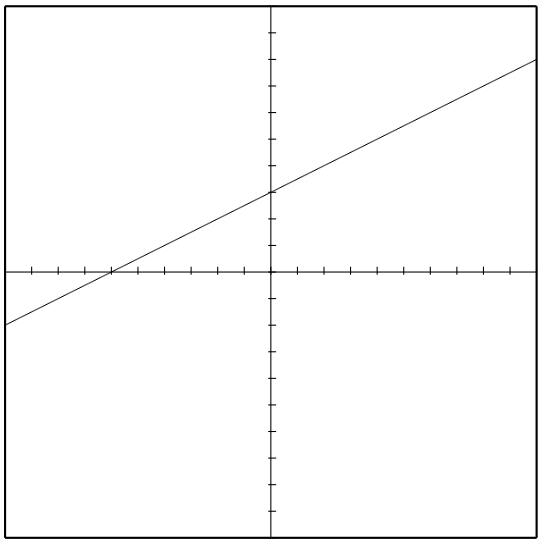
m: $\frac{5}{3}$ **b:** -5

Slope: $\frac{5}{3}$

y-intercept: $(0, -5)$

x-intercept: $(3, 0)$

Exercise 1. Consider the graph of a line. Find the standard form ($y = mx + b$) of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line.



Standard Form:

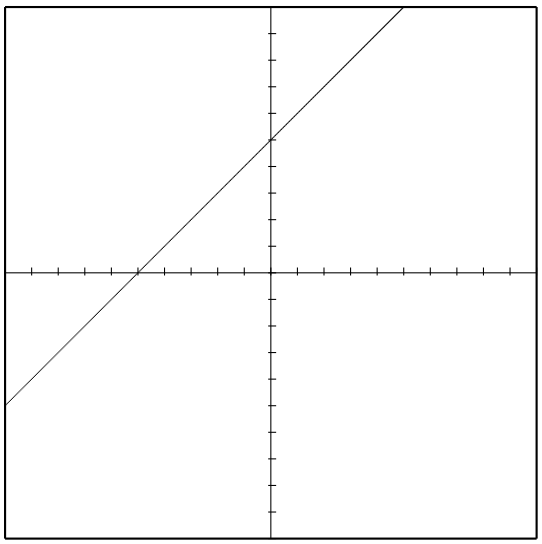
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 2. Consider the graph of a line. Find the standard form ($y = mx + b$) of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line.



Standard Form:

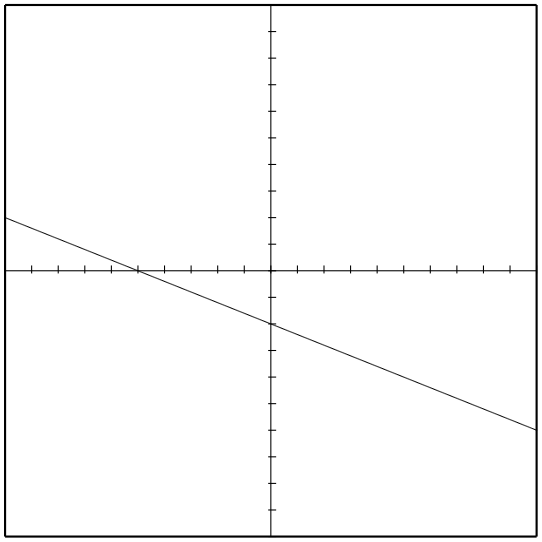
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 3. Consider the graph of a line. Find the standard form ($y = mx + b$) of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line.



Standard Form:

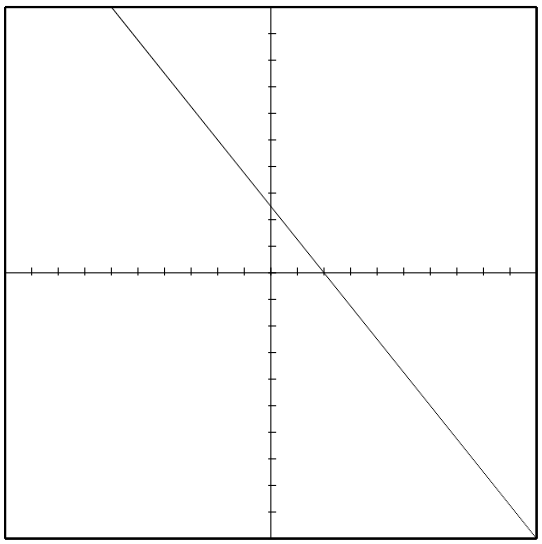
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 4. Consider the graph of a line. Find the standard form ($y = mx + b$) of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line.



Standard Form:

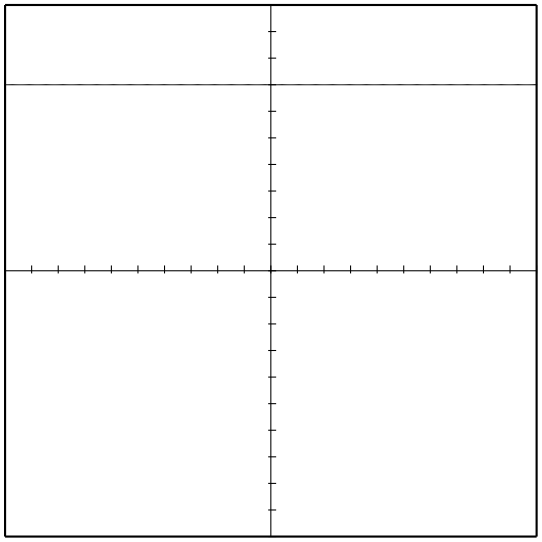
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 5. Consider the graph of a line. Find the standard form ($y = mx + b$) of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line.



Standard Form:

m: **b:**

Slope:

y-intercept:

x-intercept:

Example 2. Consider the linear equation $3x + 6y = 9$. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line. Graph the line and label these points.

Solution. First we must solve for y. Subtract $3x$ from both sides to get $6y = -3x + 9$. Divide by 6 to get

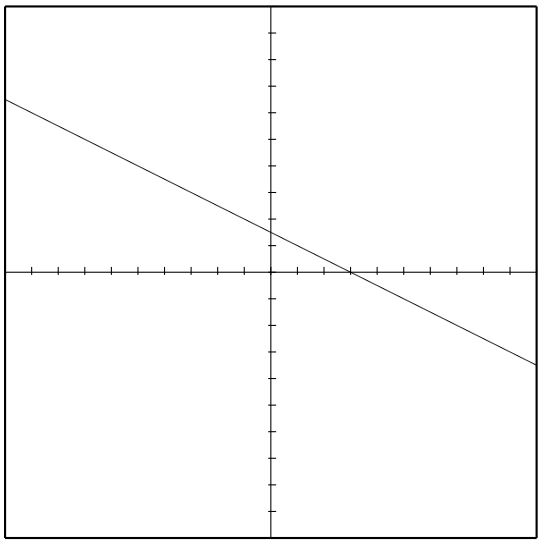
$$\boxed{y = -\frac{1}{2}x + \frac{3}{2}}.$$

Thus $m = -\frac{1}{2}$ and $b = \frac{3}{2}$.

The slope is the number in front of the x when the equation is in slope-intercept form (that is, the slope is m). In this case, the slope is $-\frac{1}{2}$. This is negative, so the graph goes down.

The y-intercept is the point where the line intersects the y-axis. This is obtained by plugging in 0 for x, and solving for y. In this case, we obtain $y = \frac{3}{2}$. The the y-intercept is the point $(0, \frac{3}{2})$.

The x-intercept is the point where the line intersects the x-axis. This is obtained by plugging in 0 for y and solving for x. In this case, we obtain $x = 3$. Thus the x-intercept is the point $(3, 0)$. □



Equation: $3x + 6y = 9$

Standard Form: $y = -\frac{1}{2}x + \frac{3}{2}$

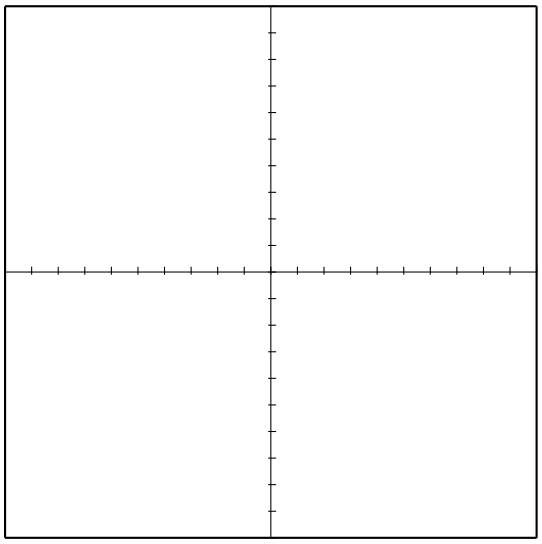
m: $-\frac{1}{2}$ **b:** $\frac{3}{2}$

Slope: $-\frac{1}{2}$

y-intercept: $(0, \frac{3}{2})$

x-intercept: $(3, 0)$

Exercise 6. Consider the linear equation $y = 3x - 6$. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line. Graph the line and label these points.



Equation: $y = 3x - 6$

Standard Form:

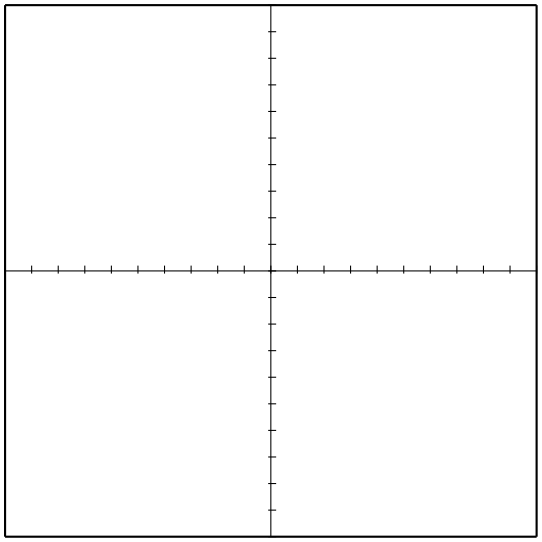
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 7. Consider the linear equation $3x - 5y = 15$. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line. Graph the line and label these points.



Equation: $3x - 5y = 15$

Standard Form:

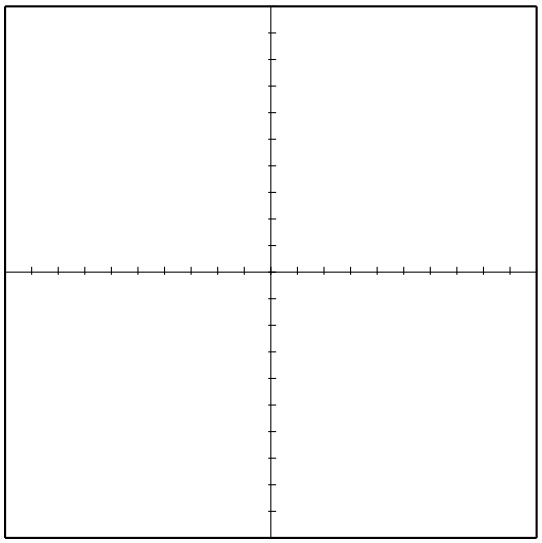
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 8. Consider the linear equation $y = -3$. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line. Graph the line and label these points.



Equation: $y = -3$

Standard Form:

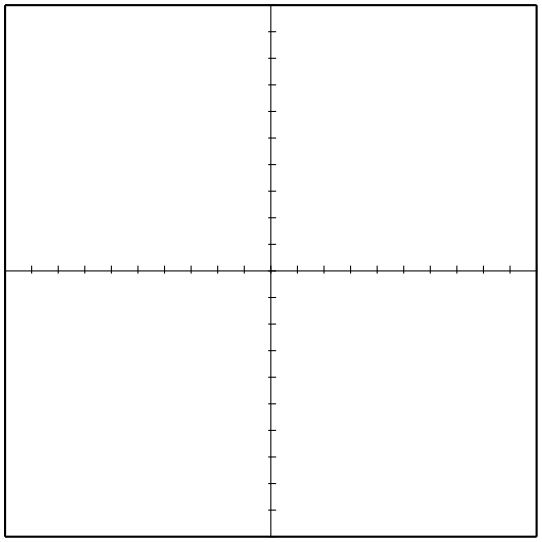
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 9. Consider the linear equation $-7y = 49 - 14x$. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line. Graph the line and label these points.



Equation: $-7y = 49 - 14x$

Standard Form:

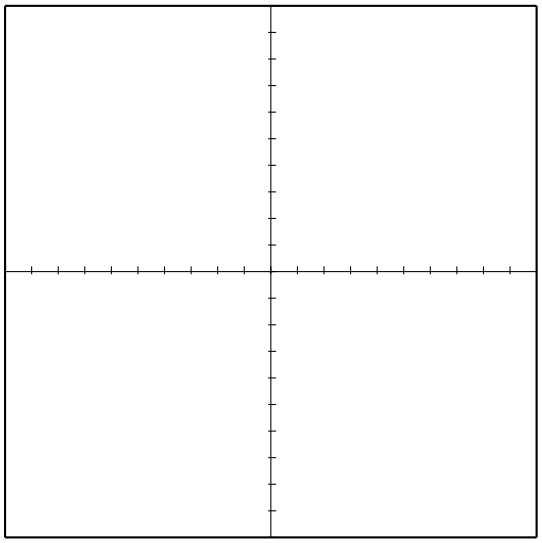
m: **b:**

Slope:

y-intercept:

x-intercept:

Exercise 10. Consider the linear equation $\frac{2x}{y} = 5$. Find the standard form $y = mx + b$ of the line, and identify the numbers m and b. Find the slope, the y-intercept, and the x-intercept (if any) of the line. Graph the line and label these points.



Equation: $\frac{2x}{y} = 5$

Standard Form:

m: **b:**

Slope:

y-intercept:

x-intercept: