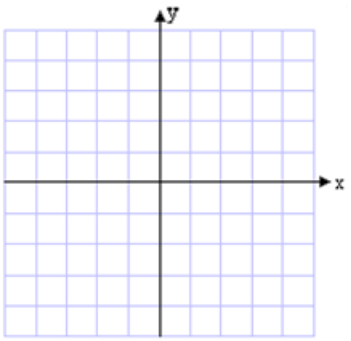
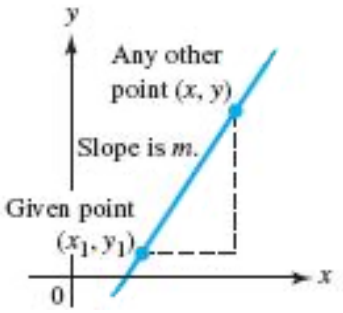
3.3 Forms of Linear Equations in Two Variables

- **slope-intercept** form: $\boldsymbol{y = mx + b}$
  - most useful when graphing or writing equation of a line with given slope and y-intercept

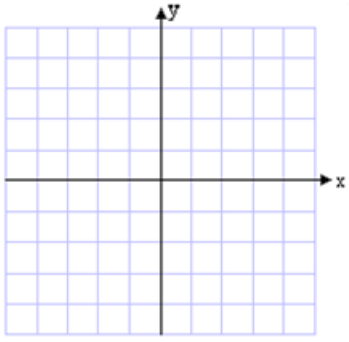
Example 1: Write an equation of a line with slope $-\frac{2}{3}$ and y-intercept at 4, and then graph it.



- **slope-point** form: $\boldsymbol{y - y_1 = m(x - x_1)}$, where (x_1, y_1) is the given point
  - most useful when writing equation of a line with given slope and a point, or two points on the line
  - notice that the slope-point formula is in fact a rearranged slope formula $\boldsymbol{m = \frac{y - y_1}{x - x_1}}$ between the given point (x_1, y_1) and an arbitrary point (x, y) on the line



Example 2: Write an equation of a line with slope $-\frac{1}{2}$, passing through the point $(-4,3)$, and then graph it.

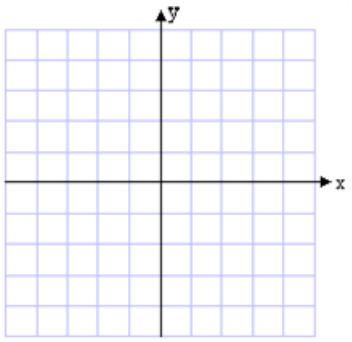


Example 3: Write an equation of a line passing through the points $\left(5, -\frac{1}{2}\right)$ and $\left(\frac{5}{6}, \frac{1}{3}\right)$.

- **standard** form: $\boldsymbol{Ax + By = C}$

  - most useful for graphing if *x*- and *y*-intercepts can be found quickly
  - notice that *x*-intercept = $\frac{C}{A}$; *y*-intercept = $\frac{C}{B}$; and slope = $-\frac{A}{B}$

Example 4: Graph the equation $3x - 4y = 12$ using *x*- and *y*-intercept method.

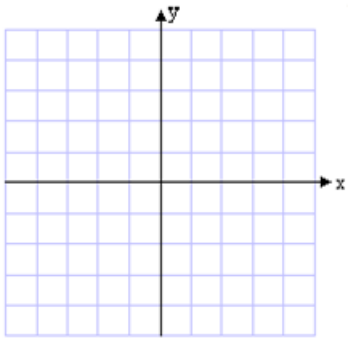


- **horizontal** line: $\boldsymbol{y = b}$
  - slope = 0; y-intercept = *b*

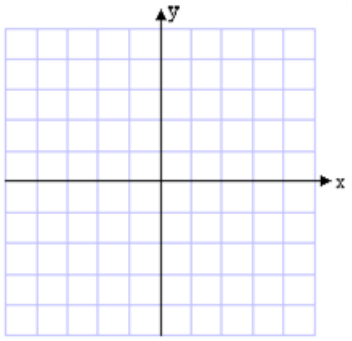
- **vertical** line: $\boldsymbol{x = a}$
  - slope is undefined; *x*-intercept = *a*

Example 5:

a) Write the equation of a line that has undefined slope and passes through the point $(2,3)$, and then graph it.



b) Write the equation of a horizontal line that passes through the point $(-2,5)$, and then graph it.



Example 6:

a) Write the equation of a line **parallel** to $-x + 2y = 7$ that passes through the point $(-2,3)$.

b) Write the equation of a line **perpendicular** to $-x + 2y = 7$ that passes through the point $(-2,3)$.

Example 7: A rental car costs \$50 plus \$0.30 per kilometre. Let x represent the number of kilometres driven and y represent the total charge to the renter.

a) Write a linear equation that relates y with x.

b) Find and interpret the y-value associated with $x = 5$.

c) How many kilometres was the car driven if the renter paid \$84.80?