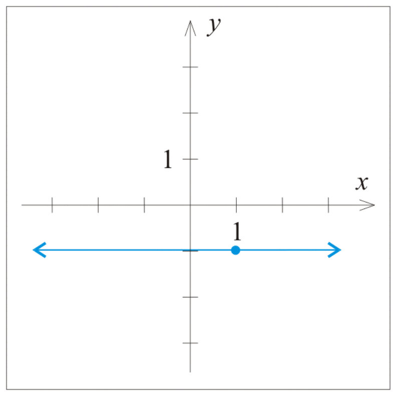
**SOLUTIONS - CHAPTER 1 EXERCISES**

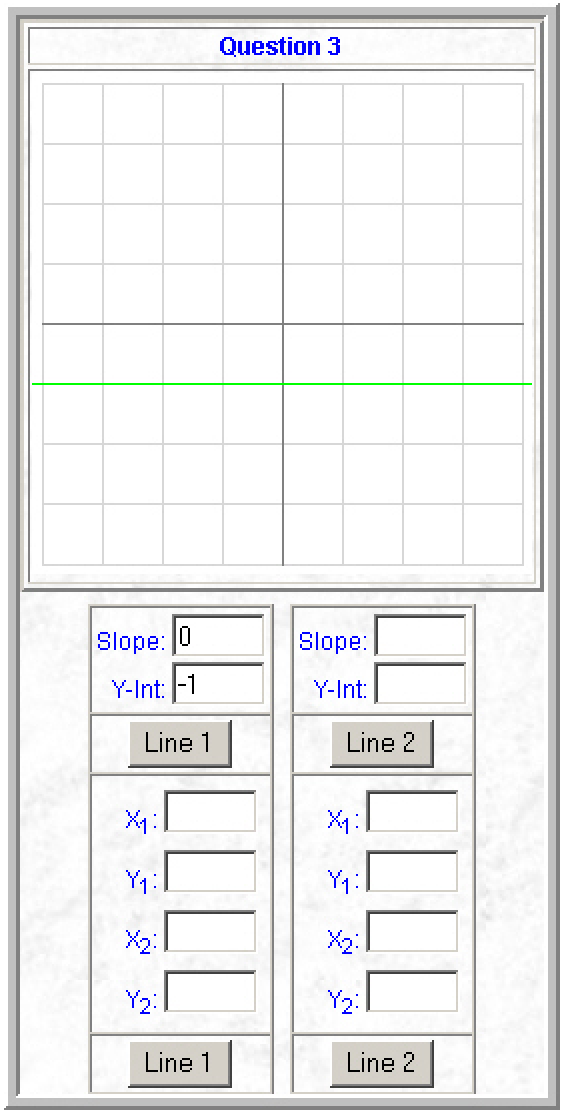
**1.1 Algebraic Method** Use the point-slope form of a line: $y - y_1 = m(x - x_1)$. A horizontal line has zero slope, so $m = 0$. The point on the line has $x_1 = 1$ and $y_1 = -1$. Substitute these values into the point-slope form to find

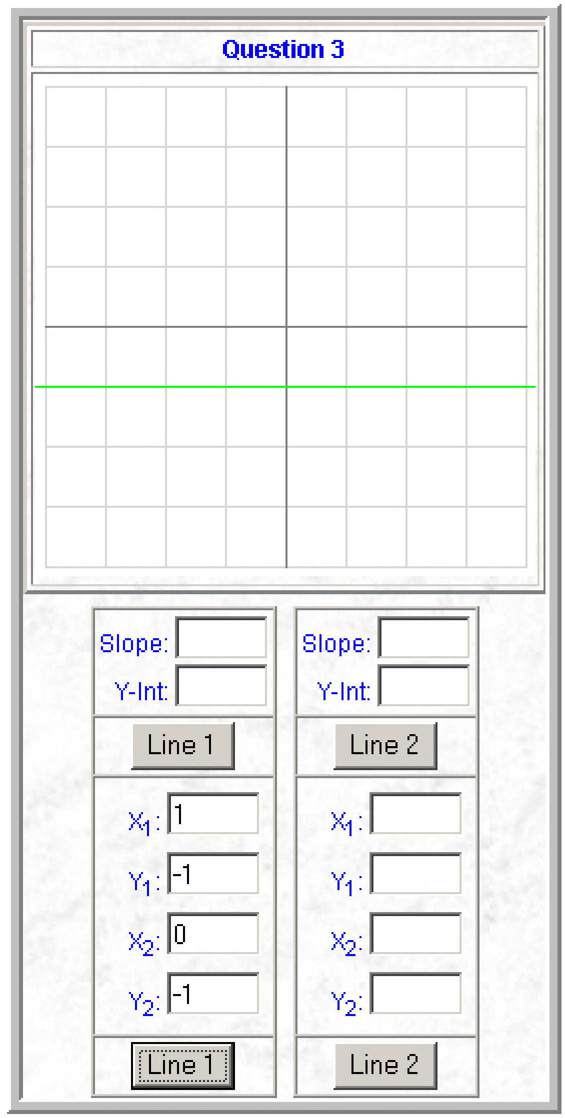
$$\begin{aligned} y - (-1) &= 0(x - 1) \\ y + 1 &= 0 \\ y &= -1 \end{aligned}$$

**Graphical Method** Graph the point $(1, -1)$ and draw a horizontal line through the point as shown below.



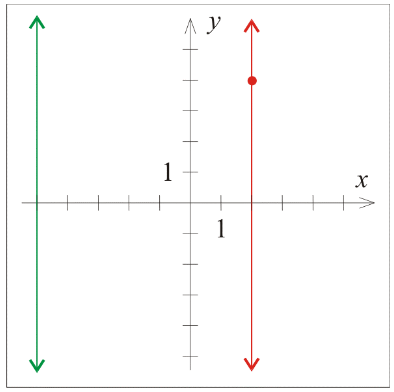

**Applet Method** The slope and *y*-intercept from the algebraic method can be entered for Line1, as shown below. Alternatively, the point $(1, -1)$ and another point with the same *y*-value, such as $(0, -1)$, can be entered as shown below.



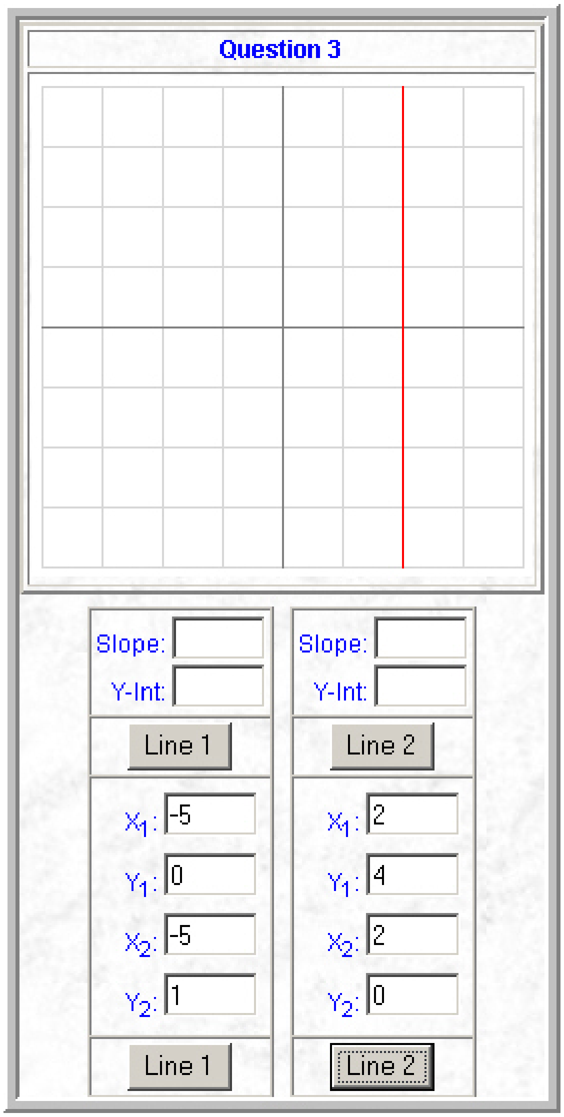




**1.3 Algebraic Method** The line $x = -5$ is vertical and, therefore, has an undefined slope. This means that the line that is parallel to $x = -5$ is also vertical and has an undefined slope. For vertical lines we need to find the *x*-value that the line passes through. We are told the line goes through $(2,4)$ and so the equation of the line is $x = 2$.

**Graphical Method** Sketch the vertical line $x = -5$ and draw a dot at the point $(2,4)$. Now, draw a vertical line through the point $(2,4)$, as shown.




**Applet Method** To graph vertical lines in the applet, two points on the line must be entered since the slope is not defined. Entering $(-5,0)$ and $(-5,1)$, and then clicking the Line1 button, as shown below, can graph the vertical line $x = -5$. (This line is not seen below because –5 it is out of the *x* range.) The line parallel to this will also be vertical and we are given that the line passes through the point $(2,4)$, so enter this as the first point for Line2. Choose another point with the same *x*-value, such as $(2,0)$, and then click the Line2 button. The vertical line through our given point is shown in red.




**1.5 Algebraic Method** For two lines to be parallel, their slopes must be the same. Line 1 passes through the points $(12,1)$ and $(10, a)$ and has a slope

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{a-1}{10-12} = \frac{a-1}{-2}$$

Line 2 passes through the points $(0,10)$ and $(6, a-7)$ and has a slope

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{a-7-10}{6-0} = \frac{a-17}{6}$$

Setting the two slopes equal,

$$m_1 = m_2$$

$$\frac{a-1}{-2} = \frac{a-17}{6}$$

$$-2(a-17) = 6(a-1)$$

$$-2a + 34 = 6a - 6$$

$$40 = 8a$$

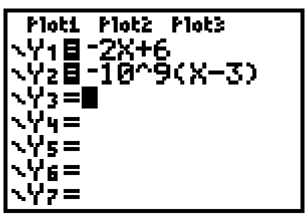
$$a = 5$$

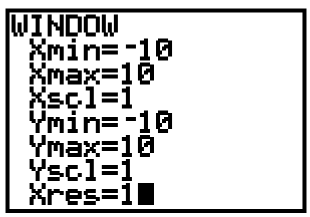
**1.7 Algebraic Method** The intersection of the two lines will be where both equations are true at the same time. We can substitute $x = 3$ into the equation $y = -2x + 6$ and solve for *y*:

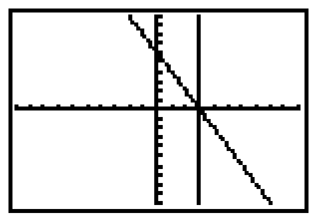
$$y = -2(3) + 6 = -6 + 6 = 0$$

Therefore, the intersection is at $(3,0)$.

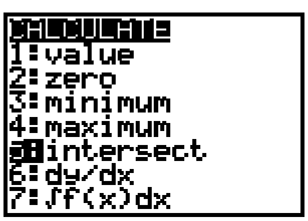
**Calculator Method (TI-83)** A graphing calculator, such as the TI-83, can find exact intersections. The line $x = 3$ cannot be entered as such, but we can enter a line with a very steep slope to approximate a vertical line. To approximate the vertical line at $x = a$, we can graph the line $y = -10^9(x - a)$. The graph of the lines is shown below.

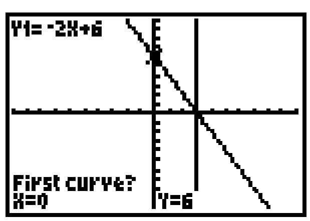


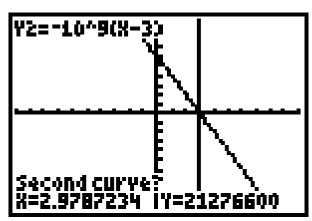



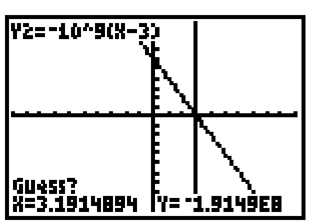



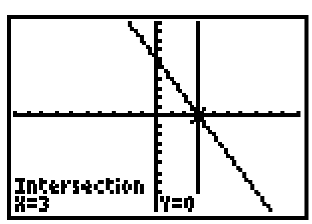
To find the intersection go to the **[2nd][CALC]** menu and choose `5:intersect`. Push the **[ENTER]** button once to choose the first line to be *Y1*, push **[ENTER]** again to choose *Y2* and then **[ENTER]** again to make a guess. The *x* and *y* values of the intersection point are shown at the bottom of the calculator screen, as shown below.



**1.9** The supply equation models how the price depends on the number of items supplied, so the "template" for a point on the supply equation line has the form $(x, p)$, where $x$ is the number of items supplied at price $p$. Here we have 200 boxes will be supplied at \$1 each, so one point is $(200, 1)$. No boxes will be supplied at \$0.75 each, so another point is $(0, 0.75)$. Start by finding the slope of the line:

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0.75 - 1}{0 - 200} = \frac{-0.25}{-200} = \frac{1}{800} = 0.00125$$

We can use either point in the point-slope form of the line. Using $(0, 0.75)$ we find

$$\begin{aligned} y - 0.75 &= 0.00125(x - 0) \\ y - 0.75 &= 0.00125x \\ y &= 0.00125x + 0.75 \end{aligned}$$

Therefore, the supply equation for the candy is $S(x) = p = 0.00125x + 0.75$.