# Examples of Modeling with Linear Functions and Equations

**Example** *Could the table represent the values of a linear function?*

| | | | | | |
|---|---|---|---|---|---|
| $x$ | 7 | 9 | 11 | 13 | 15 |
| $y$ | 43 | 46 | 49 | 52 | 55 |

***Solution*** *Yes. Notice that the changes in $x$ in the table entries in the first row are always* 2*. The corresponding changes in $y$ across the second row are always* 3*. The same change in $x$ always produces the same change in $y$.*

**Example** *Could the table represent the values of a linear function?*

| | | | | |
|---|---|---|---|---|
| $x$ | 2 | 4 | 8 | 16 |
| $y$ | 5 | 10 | 15 | 20 |

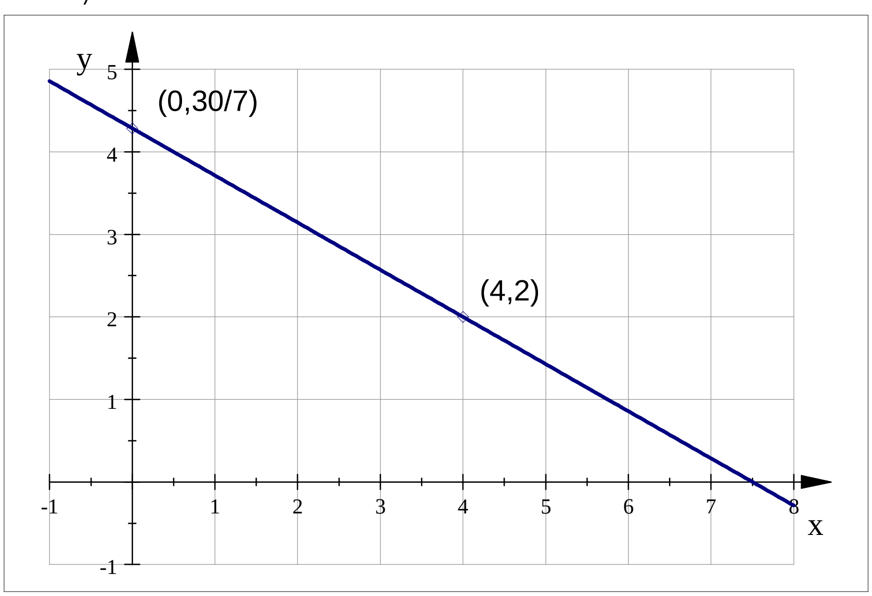
***Solution*** *No. The changes in $y$ across the bottom row are always* 5*. If the function were linear, we would see the same changes in successive $x$'s across the top row. But instead, the $\Delta x$'s are* 2, 4, 8*. And so the values are not those of a linear function.*

**Example** *In this exercise write a constraint equation, choose two solutions, and graph the equation, marking your solutions. What is the relation between the time spent walking and the time spent canoeing on a 30 mile trip if you walk at* 4 *mph and canoe at* 7 *mph?*

***Solution*** *Let $x$ represent the number of hours walking, and $y$ represent the number of hours canoeing. Since distance equals rate multiplied by time, the distance walking is $4x$ and the distance canoeing is $7y$. Since the total trip is* 30 *miles, the constraint equation is*

$$4x + 7y = 30$$

*One solution is $x = 4$ and $y = 2$, represented graphically by $(4, 2)$. Another solution is $x = 0$ and $y = \frac{30}{7}$. Here's a graph.*



**Example** *See exercise 14 on page 148 in the text.*

***Solution*** *Observe that across the row of height values, the change in h,* $\Delta h$*, is always* 2000 *meters. The corresponding change in temperature,* $\Delta T$*, is always* $-13^{\circ}\mathrm{C}$ *(temperature is decreasing). Since the same change in h always produces the same change in T, the function is linear. Its slope is* $\frac{\Delta T}{\Delta h} = \frac{-13}{2000} = -0.0065$*. The simplest formula using slope-intercept form, is*

$$T = 15 - .0065h$$