1.2 - Function Notation

- GOAL: Use function notation to represent linear and quadratic functions.

The deepest mine in the world, East Rand mine in South Africa, reaches 3585 m into Earth's crust. Another South African mine, Western Deep, is being deepened to 4100 m. Suppose the temperature at the top of the mine shaft is 11^{o}C and that it increases at a rate of 0.015 ^{o}C/m as you descend.

What is the temperature at the bottom of each mine?

Example #1

- We need to represent the situation with a function and use it to solve the problem.
- A) Represent the temperature in a mine shaft with a function. Explain why your representation is a function, and write it in **function notation.**
  - >Instead of writing for example, y = x + 3, we write **f(x) = x + 3**, where **f is a function of x**

B) Use your function to determine the temperature at the bottom of East Rand and Western Deep mines.

Example #1 co

- **The deepest mine in the world, East Ra Africa, reaches 3585 m into Earth's crust. Another South African mine, Western Deep, is being deepened to 4100 m. Suppose the temperature at the top of the mine shaft is 11°C and that it increases at a rate of 0.015 °C/m as you descend.**
- T starts at 11 °C and increases at a steady rate of 0.015 °C/m
- $T = 11 + 0.015d$, where T is temperature in °C and d is depth in meters
- This equation represents a **function**. Temperature is a function of depth.
- In function notation, $\boldsymbol{T(d) = 11 + 0.015d}$

Example #1 co

- **Now let's find the temperature at the bottom of each mine shaft.**
- **<u>East Rand Mine</u>**
- $T(3585) = 11 + 0.015(3585)$
- $= 11 + 53.775$
- $= 64.775\ ^{o}C$

<u>Western Deep</u>

$T(4100) = 11 + 0.015(4100)$

$= 11 + 61.5$

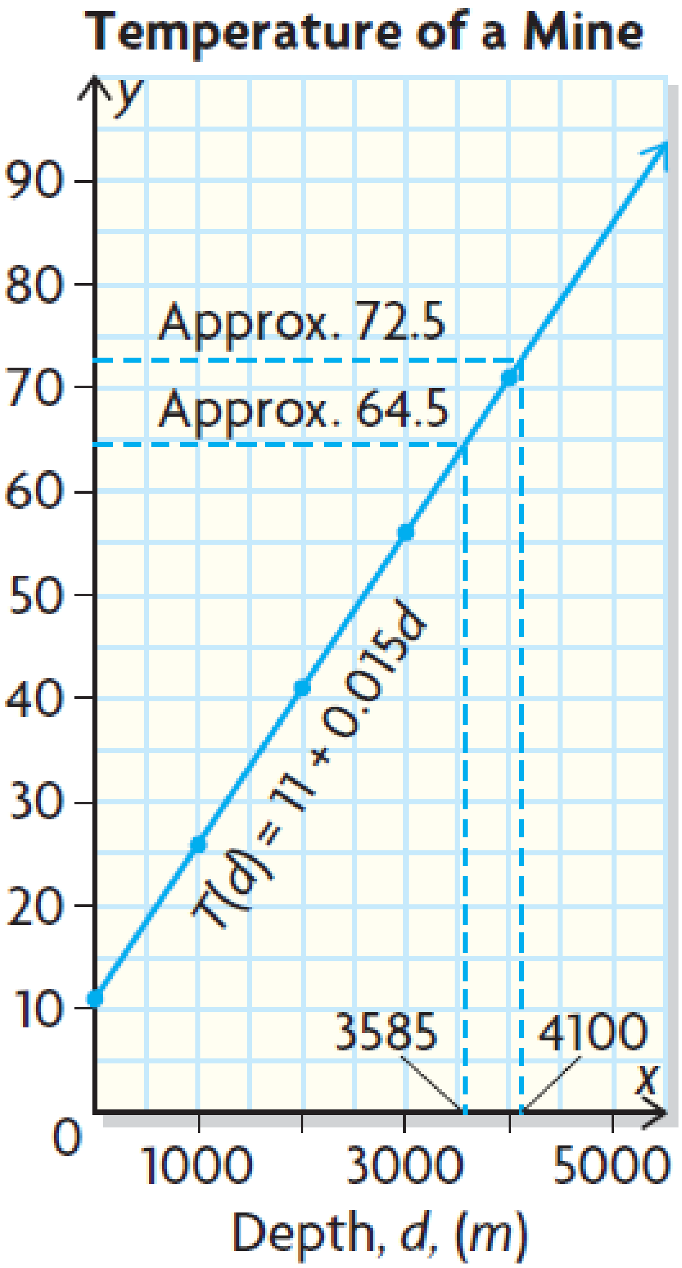
$= 72.5\ ^{o}C$

’d

- We can also make a **table of values** and th

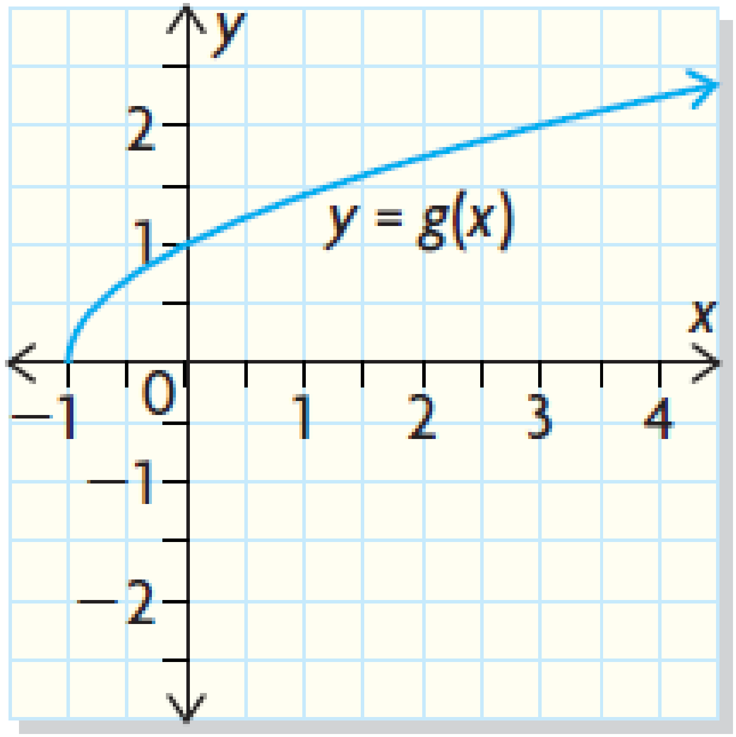
d (m)	*T*(*d*)(°C)
0	$T(0) = 11 + 0.015(0) = 11$
1000	26
2000	41
3000	56
4000	71

Create values for *d*, substitute into *T(d)* to get values in second column.



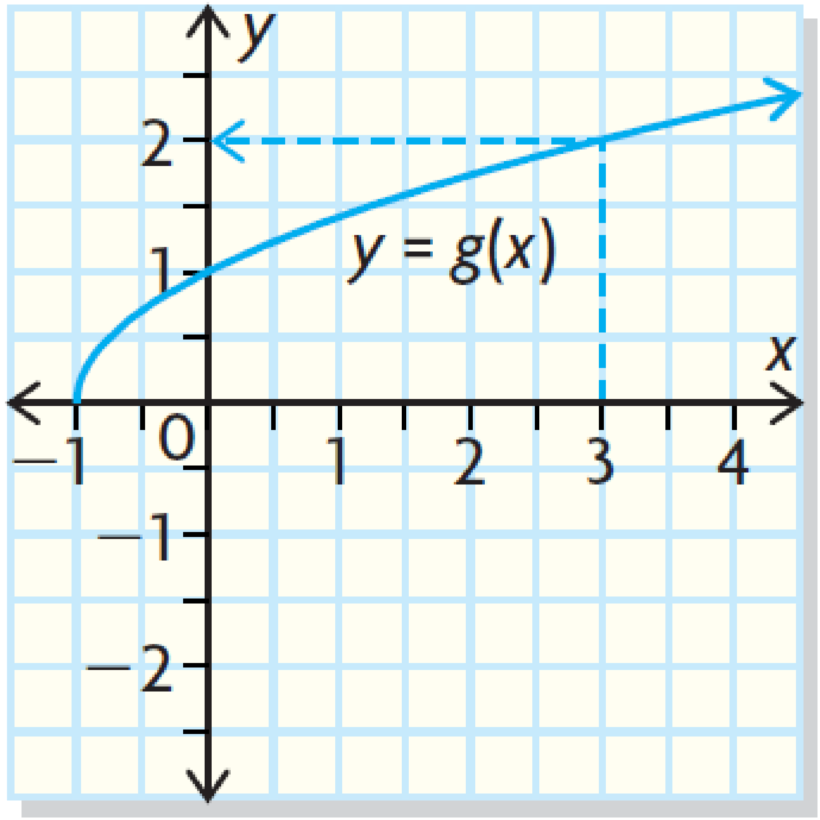
Example #3

- For the function shown in the graph, determine each value:
- A) g(3)
- B) g(-1)
- C) x if g(x) = 1
- D) the domain and range of g(x)



Example #3 cont'd

A) To find g(3), find the y-coordinate when
x = 3



The y-coordinate is y = 2.

B) When x = -1, y = 0, so g(-1) = 0.

C) g(x) = 1 when x = 0.

D) The graph begins at the point (-1, 0) and continues upward. The graph exists only for
$x \geq 1$ and $y \geq 0$

The domain is all real numbers greater than or equal to -1.
The range is all real numbers greater than or equal to 0.

Example #4

- Consider the functions $f(x) = x^2 - 3x$ and $g(x) = 1 - 2x$.
- A) Show that $f(2) > g(2)$, and explain what that means about their graphs.
- B) Determine $g(3b)$.
- C) Determine $f(c + 2) - g(c + 2)$.

- A) $f(x) = x^2 - 3x$
- $f(2) = 2^2 - 3(2)$
- $= 4 - 6$
- $= -2$

$g(x) = 1 - 2x$

$g(2) = 1 - 2(2)$

$= 1 - 4$

$= -3$

$-2 > -3$ so $f(2) > g(2)$

This means that the point on the graph of $f(x)$ is above the point on the graph of $g(x)$ when $x = 2$.

Example #4 cont'd

- Consider the functions $f(x) = x^2 - 3x$ and $g(x) = 1 - 2x$.
- A) Show that $f(2) > g(2)$, and explain what that means about their graphs.
- B) Determine $g(3b)$.
- C) Determine $f(c + 2) - g(c + 2)$.

- B) $g(x) = 1 - 2x$
- $g(3b) = 1 - 2(3b)$
- $= 1 - 6b$

Example #4 cont'd

- Consider the functions $f(x) = x^2 – 3x$ and $g(x) = 1 – 2x$.
- A) Show that $f(2) > g(2)$, and explain what that means about their graphs.
- B) Determine $g(3b)$.
- C) Determine $f(c + 2) – g(c + 2)$.

- C) $f(c + 2) – g(c + 2) = [(c + 2)^2 – 3(c + 2)] – [1 – 2(c + 2)]$
- $= [c^2 + 4c + 4 – 3c – 6] – [1 – 2c – 4]$

$= c^2 + 3c + 1$

In Summary…

- Symbols such as f(x) are called function notation, which is used to represent the value of the dependent variable *y* for a given value of the independent variable *x*
- *y* and *f(x)* are interchangeable so *y*