FAR BEYOND

MAT122

Linear Applications

Stony Brook University

Increasing Linear Function

Recall: linear function graphs as a **line**

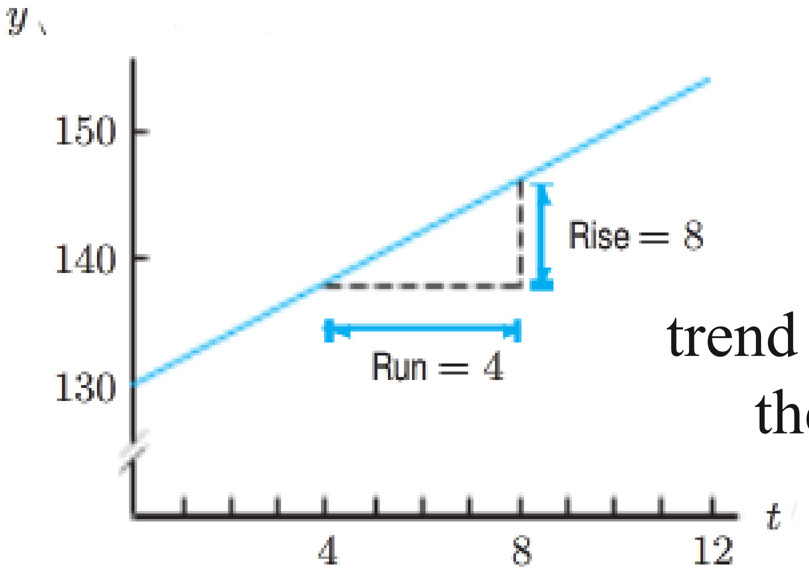
ex. In between 1900 and 1912, Olympic winning pole vault heights increased consistently at the rate of 2 inches per year.

Winning height (approximate) for Men's Olympic Pole Vault

Year	1900	1904	1908	1912
Height (inches)	130	138	146	154
	$t = 0$	$t = 4$	$t = 8$	$t = 12$

y is winning height

t is # years since 1900



then $y = f(t) = 2t + 130$ how?

rate is 2 (given) y-intercept occurs when $t = 0$

trend didn't continue past 1912

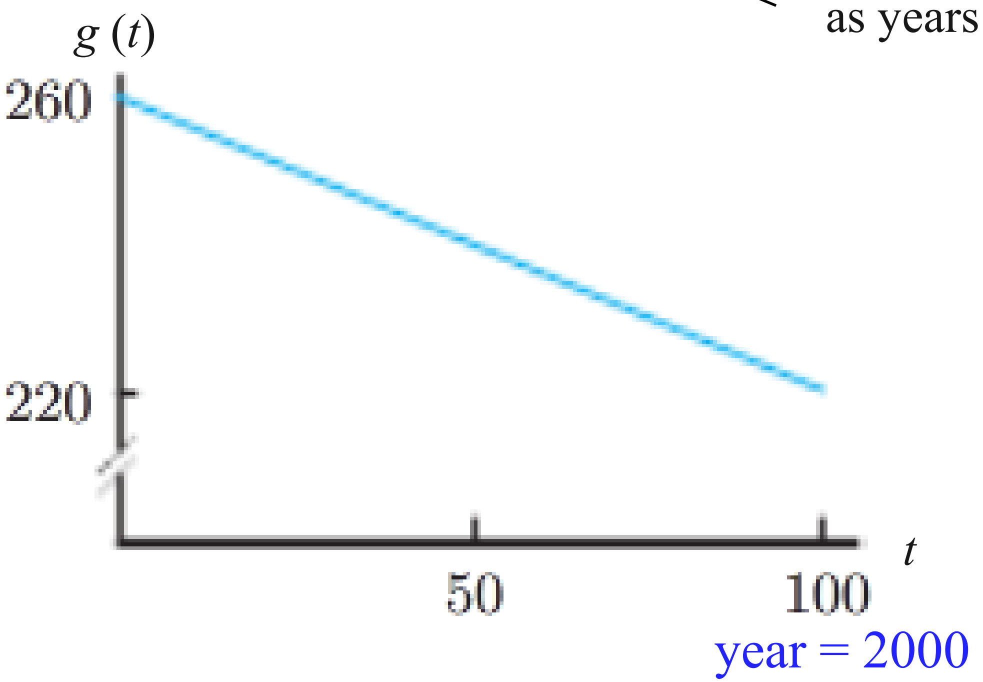
therefore can't use this model to predict later winning heights

note: even though data is discrete(1 value every 4 yrs), author chose to represent data as continuous on graph

Decreasing Linear Function

ex. In the years since 1900, the world record time to run the mile (in seconds) is represented by the model: $g(t) = -0.4t + 260$

as years went on, number of seconds to run mile decreased



interpretation: no x-intercept because… it will never take 0 seconds to run the mile

Linear Functions - Applications

$f(x) = mx + b$

ex. A clothing firm has fixed costs of \$10,000 per year.
To produce x units, it costs \$20 per unit (in addition to fixed costs).

a. Write a function that represents the total cost for x units.

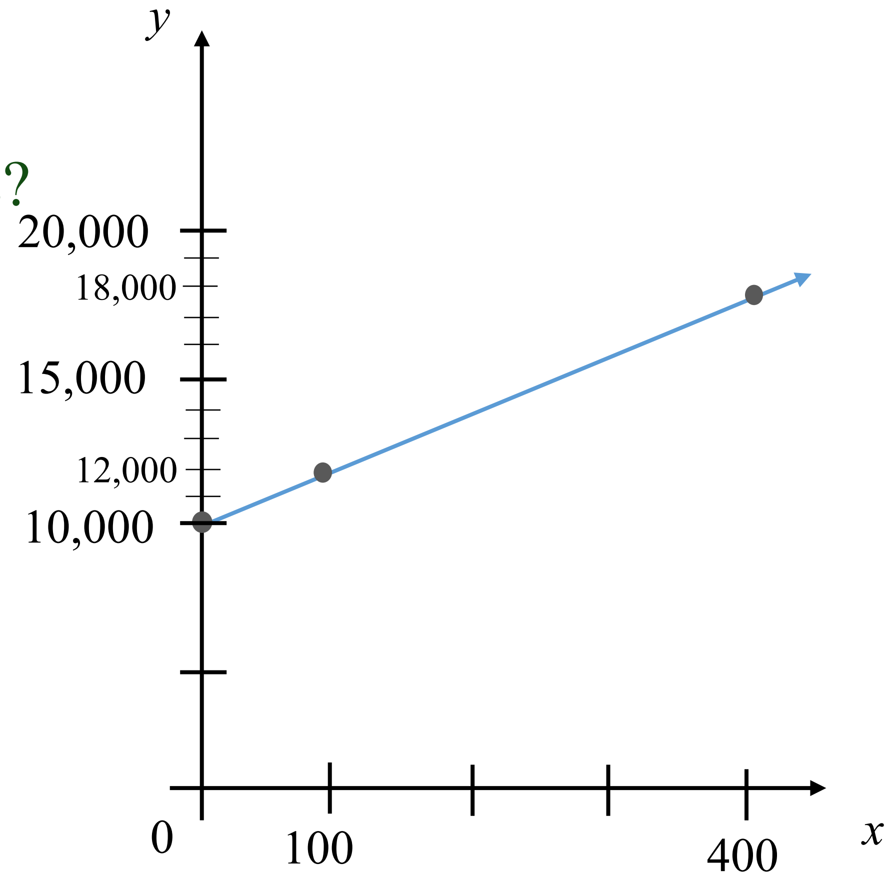
$$C(x) = \text{(variable costs)} + \text{(fixed costs)}$$
$$= 20x + 10,000$$

b. What is the total cost for producing 100 units? 400 units?

$$C(100) = 20(100) + 10,000 = 2,000 + 10,000 = \boxed{\$12,000}$$

$$C(400) = 20(400) + 10,000 = 8,000 + 10,000 = \boxed{\$18,000}$$

c. Graph the function, $C(x)$.



Profit and Loss Analysis

ex. When a business sells an item, it receives the amount (price) paid by the consumer.

Note: price is normally greater than the cost of producing the item.

The **Total Revenue** a business receives can be shown as the function $R(x)$ where:

$$R(x) = \text{(Unit Price)(Qty Sold)}$$

from previous slide: If 1 unit is sold for \$80, total revenue would be: $R(x) = 80x$

and recall: $C(x) = 20x + 10{,}000$

Then the **Break Even Point** occurs when $R(x) = C(x)$.

$$80x = 20x + 10{,}000$$

$$60x = 10{,}000$$

$$x = \frac{10{,}000}{60} \approx 167 \text{ units}$$