

Graph Story Detectives

Read how a function changes, then sketch its features.

GRADE 8 • 8.F.B.5

CCSS.Math.Content.8.F.B.5 "Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear)..."

NAME _____

DATE _____

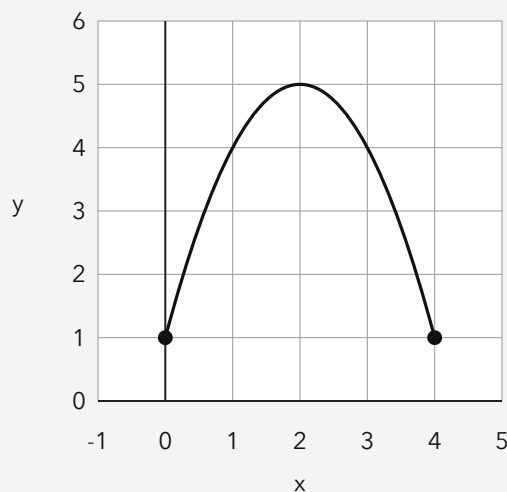
You will need: Use a pencil and ruler. Sketch on the supplied grids. Label x and y with the quantities and units given in each context. Teacher graphs are examples; other sketches satisfying every stated feature are valid.

READ THE SHAPE

Read left to right: increasing means outputs rise, decreasing means they fall, and constant means they stay the same. A linear function has one straight-line graph and one constant rate of change. A curve or a graph with changing slopes is nonlinear overall. Different straight pieces may each be linear on their own interval.

WORKED EXAMPLE

Read the graph over $0 \leq x \leq 4$. Where does the function increase and decrease? Is it linear overall?



1. Follow the curve from its left endpoint toward the right.
2. It rises until $x = 2$ and then falls.
3. Its rate changes; the whole graph is not one straight line.

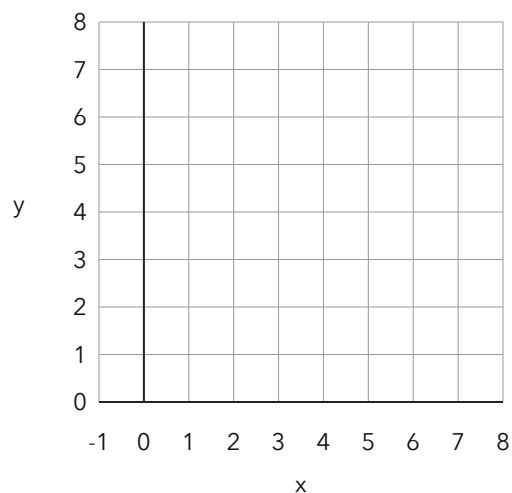
Answer: Increasing from $x = 0$ to 2 ; decreasing from $x = 2$ to 4 ; nonlinear.

PRACTICE 4 problems

For each sketch, use every stated interval and keep just one output for each input. Explain qualitative features without needing a formula.

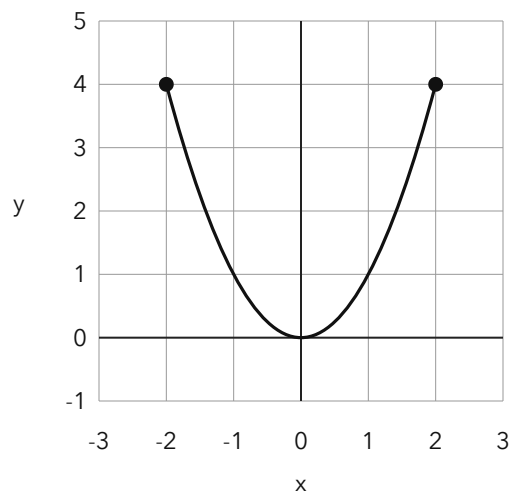
- 1** Sketch a function that rises linearly from $x = 0$ to 2, is constant from $x = 2$ to 5, then falls linearly from $x = 5$ to 7. Choose your own outputs.

ANSWER _____



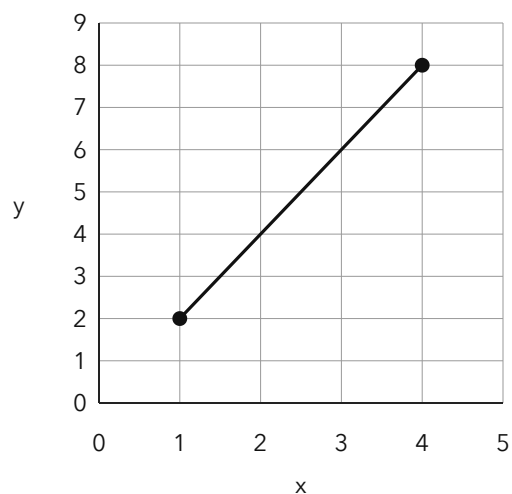
- 2** Read this graph on $-2 \leq x \leq 2$. Where is it decreasing and increasing? Is the whole graph linear?

ANSWER _____



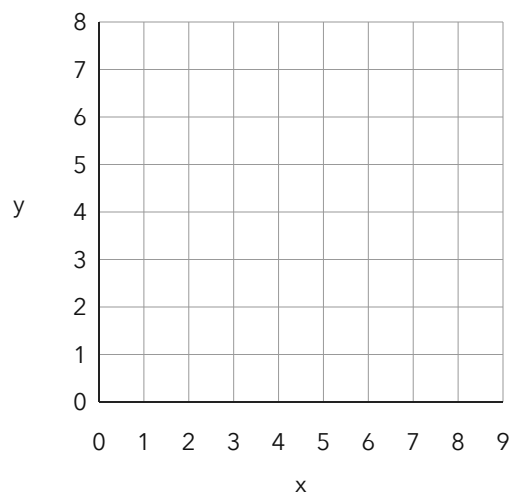
- 3** Read this graph on $1 \leq x \leq 4$. Describe its direction and rate of change. Is it linear?

ANSWER _____



- 4** Sketch a straight decreasing segment from $(1,6)$ to $(5,2)$. Continue from $(5,2)$ with a curved increasing section ending at $(8,7)$.

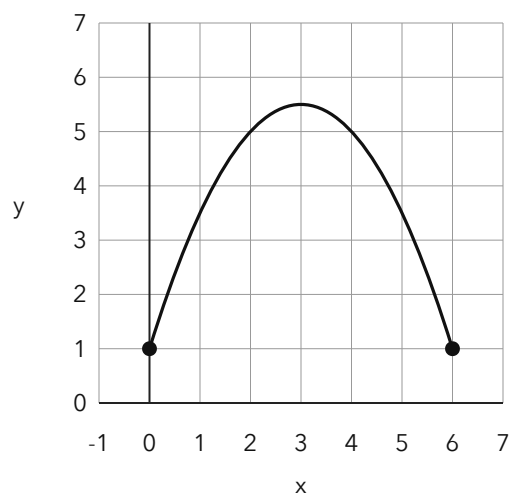
ANSWER _____



APPLY IT Show your work

- 1** This model uses x for time in seconds and y for a small drone's height in meters. Describe its motion from 0 to 6 seconds. When is height increasing or decreasing? Is the whole relationship linear?

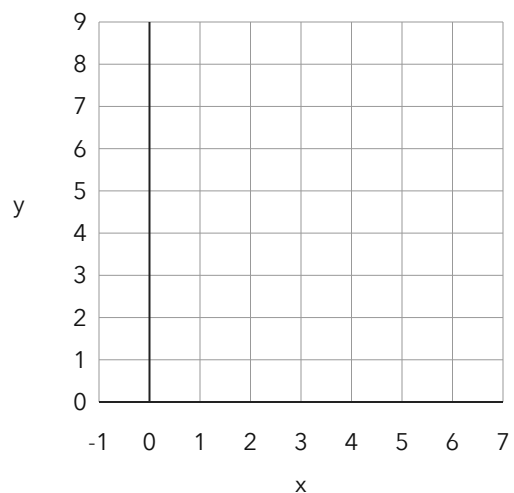
REASONING AND ANSWER



— Drone height model

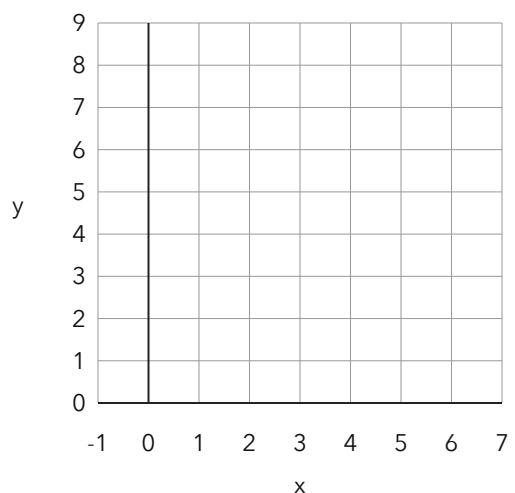
2

A tank holds 1 liter at minute 0. It fills at a constant fast rate until minute 2, then at a constant slower rate through minute 6. Sketch a possible graph: x is minutes, y is liters. Is it linear overall?

REASONING AND ANSWER**CHALLENGE** One step up

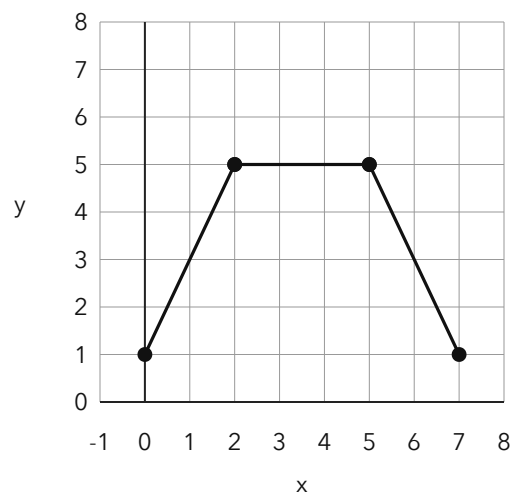
Water is 2 cm deep at minute 0. Depth rises steadily by 2 cm per minute through minute 3, stays constant through minute 5, then falls steadily by 4 cm by minute 6. Sketch depth (y , cm) versus time (x , minutes). Explain why the graph is nonlinear overall.

WORK SPACE AND ANSWER



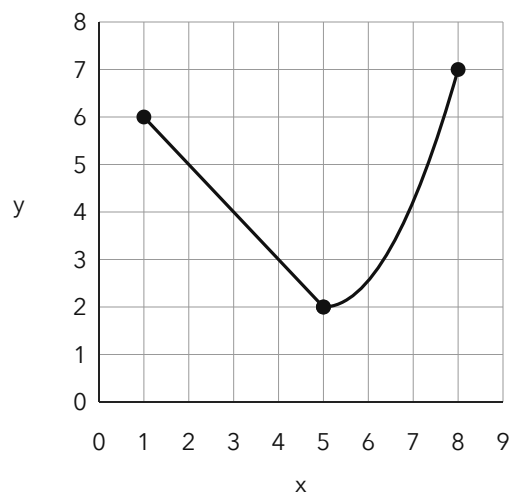
PRACTICE 1

Example: join $(0,1)$, $(2,5)$, $(5,5)$, $(7,1)$. Other heights work if all three intervals behave as stated.



PRACTICE 4

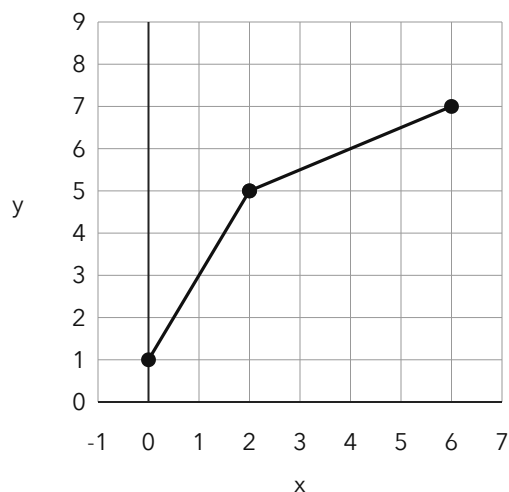
The first part is straight and decreasing; the second is curved and increasing. Join them at $(5,2)$.



APPLY IT 2

Example: join $(0,1)$, $(2,5)$, $(6,7)$. Both parts rise, but the second slope is smaller.

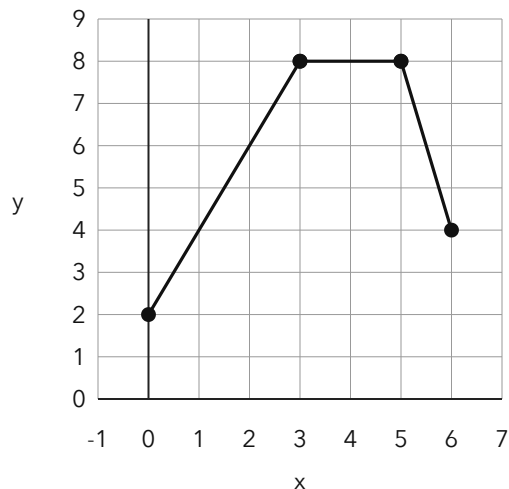
Nonlinear overall. The amount continues increasing after minute 2; it does not become flat. Different constant rates make two different slopes.



CHALLENGE

Join $(0,2)$, $(3,8)$, $(5,8)$, $(6,4)$. Slopes are positive, then zero, then negative, so the whole graph is not one line.

Check actual student sketches, including intervals, joined pieces and one output per input. Different heights in Practice 1 and different filling rates in Apply It 2 are acceptable. Practice 4 needs an actually curved second part. For intervals, accept equivalent language identifying the turning points. A table of four values alone would not establish an entire function is linear; Practice 3 supplies the straight graph.



PRACTICE 2

Decreases from -2 to 0, increases from 0 to 2; nonlinear.

PRACTICE 3

Increasing at a constant rate of 2 output units per input unit; linear.

APPLY IT 1

The drone rises from 0 to 3 seconds and descends from 3 to 6 seconds. The relationship is nonlinear. The height curve turns at 3 seconds and is not one straight line.