

Line or Curve

Decide which functions make straight-line graphs.

GRADE 8 • 8.F.A.3

CCSS.Math.Content.8.F.A.3 "Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example..."

NAME _____

DATE _____

THE BIG IDEA

A function is linear when it can be written in the form $y = mx + b$, where m and b are constants. A linear function has a constant rate of change, so its graph is a straight line. If equal changes in the input do not make equal changes in the output, the function is not linear.

WORKED EXAMPLE

Is $y = 7x - 13$ linear? Identify m and b .

1. The equation matches the form $y = mx + b$.
2. $m = 7$ and $b = -13$.
3. A constant slope of 7 makes a straight-line graph.

Answer: Yes. It is linear, with $m = 7$ and $b = -13$.

PRACTICE 6 problems

- 1** For $y = 3x + 5$, is the function linear? State m and b .

ANSWER _____

- 2** Is $y = x^2 - 1$ a linear function? Explain in one sentence.

ANSWER _____

- 3** For $y = -2x + 6$, find y when $x = 4$. Is the graph a straight line?

ANSWER _____

- 4** The table shows a function. $x \mid -1 \mid 0 \mid 1 \mid 2 \mid y \mid 4 \mid 2 \mid 0 \mid -2$ Is the function linear? If so, write its equation.

ANSWER _____

- 5** The points $(0, -3)$, $(2, 1)$, and $(4, 5)$ are on a graph. Do the points lie on a straight line? Write the equation of the line.

ANSWER _____

- 6** The function $y = 5$ has the same output for every input. Is it linear? Write it in $y = mx + b$ form.

ANSWER _____

APPLY IT Show your work

- 1** At a school esports event, headset rental costs \$4 to start and \$3 for each hour h . Write C as a function of h . Is the function linear? Find C when $h = 5$.

WORK SPACE

ANSWER _____

- 2** For a custom square phone decal, area A in square centimeters is $A = s^2$, where s is the side length in centimeters. Is A linear in s ? Use $A(4)$, $A(5)$, and $A(6)$ to support your answer.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A table represents a function. $x \mid 0 \mid 2 \mid 4 \mid 6 \mid y \mid 9 \mid 5 \mid 1 \mid -3$ Is the function linear? Write its equation, find y when $x = 10$, and explain how the table supports your answer.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	For $y = 3x + 5$, is the function linear? State m and b .	Yes. It is linear, with $m = 3$ and $b = 5$.
2	Is $y = x^2 - 1$ a linear function? Explain in one sentence.	No. The change in y is not constant, so its graph is not a straight line.
3	For $y = -2x + 6$, find y when $x = 4$. Is the graph a straight line?	$y = -2$ when $x = 4$. Yes, the graph is a straight line.
4	The table shows a function. $x \mid -1 \mid 0 \mid 1 \mid 2 \mid y \mid 4 \mid 2 \mid 0 \mid -2$ Is the function linear? If so, write its equation.	Yes. The equation is $y = -2x + 2$.
5	The points $(0, -3)$, $(2, 1)$, and $(4, 5)$ are on a graph. Do the points lie on a straight line? Write the equation of the line.	Yes. The points lie on a straight line with equation $y = 2x - 3$.
6	The function $y = 5$ has the same output for every input. Is it linear? Write it in $y = mx + b$ form.	Yes. It is linear and can be written as $y = 0x + 5$.

PART 2 • APPLY IT

- $C = 3h + 4$. The function is linear. $C = \$19$ when $h = 5$.** The starting fee is $b = 4$ and the hourly rate is $m = 3$.
Substitute 5 for h to get $C = 3(5) + 4 = 19$.
- No. $A(4) = 16$, $A(5) = 25$, and $A(6) = 36$. When s increases by 1, the area increases by 9 and then by 11, so the rate of change is not constant.** Evaluate the function at the three side lengths. The output changes are unequal for equal input changes, so the function is not linear.

CHALLENGE

Yes. The equation is $y = -2x + 9$, and $y = -11$ when $x = 10$. Each increase of 2 in x causes a decrease of 4 in y , which is a constant rate of -2 for each increase of 1 in x .

Accept equivalent statements that identify a constant rate of change and a straight-line graph. For linear equations, accept equivalent forms that simplify to the stated equation.