

Function Feature Faceoff

Compare patterns, rates, and shapes across function forms.

HIGH SCHOOL • MA.912.F.1.6

MA.912.F.1.6 "Compare key features of linear and nonlinear functions each represented algebraically, graphically, in tables or written descriptions."

NAME _____

DATE _____

SPOT THE PATTERN

A linear function has a constant rate of change. Its graph is a straight line, and equal changes in x cause equal changes in y . A nonlinear function has a changing rate of change, so its graph is not a straight line.

WORKED EXAMPLE

Decide whether $y = 17x - 14$ is linear. State its rate of change and y -intercept.

1. The equation has x to the first power.
2. The coefficient of x is 17, so the rate of change is 17.
3. The constant term is -14, so the y -intercept is -14.

Answer: Linear; rate of change = 17; y -intercept = -14.

PRACTICE 6 problems

- 1** Is $y = 4x + 9$ linear or nonlinear? State its slope and y -intercept.

ANSWER _____

- 2** Is $y = x^2 - 2$ linear or nonlinear? Explain using the equation.

ANSWER _____

- 3** The table shows a function. x : 1, 2, 4 y : 6, 10, 18 Is the function linear or nonlinear? Write its rule.

ANSWER _____

- 4** A graph is a straight line through (0, 4) and (3, -2). Is the function linear or nonlinear? State its slope and y -intercept.

ANSWER _____

- 5** A gaming club charges a \$20 membership fee plus \$7 for each tournament entered. Let x be the number of tournaments. Is the total cost linear or nonlinear? Write a rule.

ANSWER _____

- 6** Function A is $y = -2x + 1$. Function B is shown in the table. x : 0, 1, 2, 3 y : 3, 1, 3, 9 Which function is linear? How do the changes in y show this?

ANSWER _____

APPLY IT Show your work

1

Two creators track new followers. Creator A has 18 followers on day 0 and gains 4 followers each day. Creator B has the totals shown below. Day: 0, 1, 2, 3 Followers: 1, 7, 19, 37 Which creator has a linear follower pattern? How many followers does each creator have on day 3? Who has more followers, and by how many?

WORK SPACE

ANSWER _____

2

A student compares storage used by two video projects. Project A starts at 9 GB and adds 3 GB each week. Project B has the storage amounts shown below. Week: 0, 1, 2, 3 Storage used in GB: 1, 4, 9, 16 Which project has nonlinear storage growth? At week 3, how much more storage does the larger project use?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

Assuming the pattern continues, classify the function shown in the table as linear, quadratic, or neither. Explain using first and second differences, then write a rule. x: 0, 1, 2, 3 y: 4, 7, 12, 19

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	Is $y = 4x + 9$ linear or nonlinear? State its slope and y-intercept.	Linear; slope = 4; y-intercept = 9.
2	Is $y = x^2 - 2$ linear or nonlinear? Explain using the equation.	Nonlinear; x is squared, not just to the first power.
3	The table shows a function. x: 1, 2, 4 y: 6, 10, 18 Is the function linear or nonlinear? Write its rule.	Linear; $y = 4x + 2$.
4	A graph is a straight line through (0, 4) and (3, -2). Is the function linear or nonlinear? State its slope and y-intercept.	Linear; slope = -2; y-intercept = 4.
5	A gaming club charges a \$20 membership fee plus \$7 for each tournament entered. Let x be the number of tournaments. Is the total cost linear or nonlinear? Write a rule.	Linear; $y = 7x + 20$.
6	Function A is $y = -2x + 1$. Function B is shown in the table. x: 0, 1, 2, 3 y: 3, 1, 3, 9 Which function is linear? How do the changes in y show this?	Function A is linear with slope -2. Function B is nonlinear because its y-changes are -2, +2, and +6, which are not constant.

PART 2 • APPLY IT

- Creator A is linear. On day 3, Creator A has 30 followers and Creator B has 37 followers. Creator B has 7 more followers.** Creator A follows $y = 4x + 18$, so day 3 has 30 followers. Creator B's increases are 6, 12, and 18, so its pattern is nonlinear.
- Project B has nonlinear storage growth. At week 3, Project A uses 18 GB and Project B uses 16 GB, so Project A uses 2 GB more.** Project A has a constant increase of 3 GB each week, so it is linear. Project B's increases are 3, 5, and 7 GB, so it is nonlinear.

CHALLENGE

Quadratic, so it is nonlinear. The first differences are 3, 5, and 7, and the second differences are 2 and 2. A rule is $y = x^2 + 2x + 4$.

Accept equivalent linear rules, such as $y = 20 + 7x$. For nonlinear classifications, accept a correct explanation based on a changing rate, a non-straight graph, or a squared x term.