Straight or Not?

Sort functions by how their outputs change.

8A.AF.H.23.a "Distinguish between linear and non-linear functions."

NAME _____ DATE _____

LINEAR

A linear function has a constant rate of change. Equal input steps always give equal output changes.

A candle is 18 cm tall and gets 2 cm shorter each hour while it burns.

NONLINEAR

A nonlinear function does not have a constant rate of change. Equal input steps do not always give equal output changes.

A square's area is its side length multiplied by itself: $A = s^2$.

1 SORT

8 items

For each item, circle LINEAR or NONLINEAR, then choose one item from each category and explain how you know.

1. $y = 3x + 4$ — LINEAR / NONLINEAR

2. (0, 6), (1, 9), (2, 12), (3, 15) — LINEAR / NONLINEAR

3. $y = x^2 + 4$ — LINEAR / NONLINEAR

4. A gym charges $12 to join and $5 per visit. Cost depends on visits. — LINEAR / NONLINEAR

5. (0, 2), (1, 4), (2, 8), (3, 16) — LINEAR / NONLINEAR

6. A colony starts with 10 bacteria and doubles every hour. — LINEAR / NONLINEAR

7. $y = 10 - 2x$ — LINEAR / NONLINEAR

8. (0, 10), (2, 13), (4, 16), (6, 20) — LINEAR / NONLINEAR

2 PROVE IT

Explain your thinking

Choose one item from each category and explain how you know.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new linear function and one new nonlinear function as equations using x and y.

LINEAR _____

NONLINEAR _____

CHALLENGE

Write four ordered pairs with x-values 0, 1, 2, and 3. Make the first three y-values change by the same amount, but make the full set nonlinear. Explain why it is nonlinear.

ANSWER KEY # Straight or Not?

GRADE 8 · 8A.AF.H.23.a

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	$y = 3x + 4$	**LINEAR**	For every increase of 1 in x, y increases by 3.
2	(0, 6), (1, 9), (2, 12), (3, 15)	**LINEAR**	For each increase of 1 in x, y increases by 3.
3	$y = x^2 + 4$	**NONLINEAR**	The squared term makes the rate of change vary.
4	A gym charges $12 to join and $5 per visit. Cost depends on visits.	**LINEAR**	Each additional visit adds $5 to the cost.
5	(0, 2), (1, 4), (2, 8), (3, 16)	**NONLINEAR**	For equal x steps, the y changes are 2, 4, and 8.
6	A colony starts with 10 bacteria and doubles every hour.	**NONLINEAR**	The number added each hour grows, so the rate of change is not constant.
7	$y = 10 - 2x$	**LINEAR**	For every increase of 1 in x, y decreases by 2.
8	(0, 10), (2, 13), (4, 16), (6, 20)	**NONLINEAR**	For equal x steps of 2, the y changes are 3, 3, and 4.

PART 2 · PROVE IT

Task: Choose one item from each category and explain how you know.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **LINEAR**: $y = 7x - 3$
- **NONLINEAR**: $y = x^2 - 1$

Challenge: (0, 2), (1, 5), (2, 8), (3, 12). The y-values change by 3, 3, and 4 for equal x steps, so the rate is not constant.

For Part 2, accept explanations that correctly use equal input steps and output changes, or identify the rate in a verbal rule. For Part 3, each equation must give exactly one y-value for each x-value.