LESSON MAKER PRO

Beyond the Grid

Read what parent-function graphs reveal.

HIGH SCHOOL · FA.F.21

FA.F.21 "Describe the following characteristics of linear and quadratic parent functions by inspection: domain/range, increasing/decreasing intervals, intercepts, symmetry, and asymptotic behavior..."

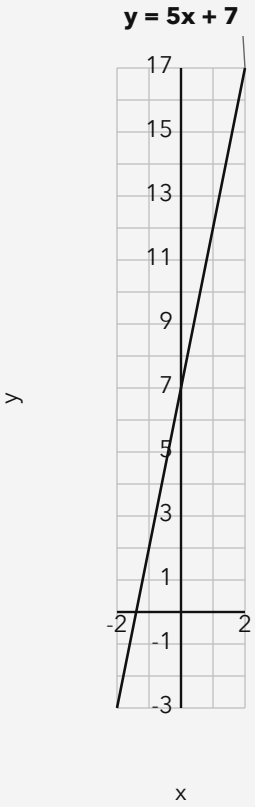
NAME _____ DATE _____

READ THE WHOLE GRAPH

A graph can continue beyond the edges of its grid, so do not treat the grid border as an endpoint. Read domain from left to right and range from bottom to top; describe where the graph rises or falls as x moves right. Check whether a reflection or half-turn leaves the graph unchanged, and look for a line the graph gets closer to without reaching.

WORKED EXAMPLE

Inspect the linear graph. State its domain, range, and increasing interval.

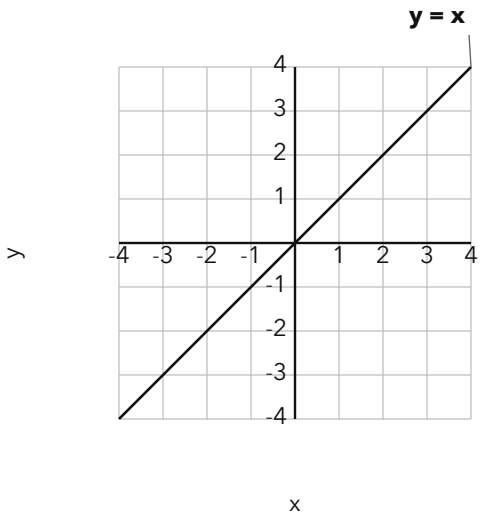


1. The line continues beyond the grid to the left and right, so its domain is all real numbers.
2. It also continues downward and upward without bound, so its range is all real numbers.
3. The line rises as x moves right, so it increases for all real x.

Answer: Domain: (-∞, ∞); range: (-∞, ∞); increasing: (-∞, ∞).

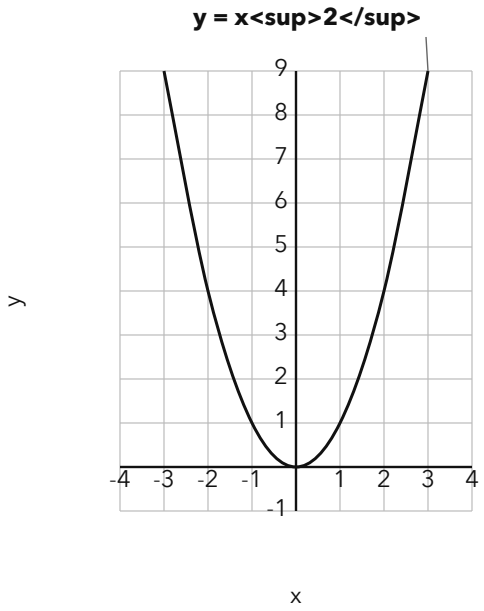
PRACTICE 6 problems

1 Inspect the linear parent graph. Give its x-intercept and y-intercept. State its symmetry.



ANSWER _____

2 Inspect the quadratic parent graph. State its domain and range.



ANSWER _____

3 For the parent function $y=x^2$, give the interval where the function decreases and the interval where it increases.

ANSWER _____

4 For the parent function $y=x$, write the domain and range in set notation.

ANSWER _____

5 For the parent function $y=x^2$, give the x-intercept and y-intercept.

ANSWER _____

6 Does either parent function, $y=x$ or $y=x^2$, have a horizontal or vertical asymptote? Explain briefly.

ANSWER _____

APPLY IT Show your work

1 A music app marks elapsed time y in seconds to match playback time x in seconds, so y=x. A track lasts 180 seconds. State the realistic domain and range for this track. Does y increase as x increases?

WORK SPACE

ANSWER _____

2 In a video game, a character's horizontal position x can be anywhere from -3 to 3 units from the center of a target. The miss penalty is $y=x^2$. State the domain and range for this situation. Where does the penalty decrease, and where does it increase?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A student says, "Both parent graphs extend without end, so both have a range of all real numbers and neither has symmetry." Correct both errors. Then describe what happens to y at the far left and far right of each graph.

WORK SPACE AND ANSWER

Beyond the Grid

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Inspect the linear parent graph. Give its x-intercept and y-intercept. State its symmetry.	**Both intercepts are (0, 0). The graph has symmetry about the origin.**
2	Inspect the quadratic parent graph. State its domain and range.	**Domain: (-∞, ∞); range: [0, ∞).**
3	For the parent function $y=x^2$, give the interval where the function decreases and the interval where it increases.	**Decreasing: (-∞, 0); increasing: (0, ∞).**
4	For the parent function y=x, write the domain and range in set notation.	**Domain: {x | x ∈ R}; range: {y | y ∈ R}.**
5	For the parent function $y=x^2$, give the x-intercept and y-intercept.	**x-intercept: (0, 0); y-intercept: (0, 0).**
6	Does either parent function, y=x or $y=x^2$, have a horizontal or vertical asymptote? Explain briefly.	**Neither has a horizontal or vertical asymptote. Neither graph approaches a fixed horizontal or vertical line at its ends.**

PART 2 · APPLY IT

1. **Domain: [0, 180] seconds; range: [0, 180] seconds. Yes, y increases as x increases.** Playback time starts at 0 and ends at 180 seconds. Each output equals its input.
2. **Domain: [-3, 3]; range: [0, 9]. The penalty decreases on [-3, 0] and increases on [0, 3].** The smallest penalty is 0 at the center, and the largest is 9 at either allowed endpoint. Moving toward the center lowers the penalty; moving away raises it.

CHALLENGE

For y=x, the range is all real numbers and the graph has symmetry about the origin. Its y-values decrease without bound to the far left and increase without bound to the far right. For $y=x^2$, the range is [0, ∞) and the graph has symmetry about the y-axis. Its y-values increase without bound at both ends.

Accept equivalent set notation for intervals. For increasing and decreasing intervals, endpoints may be included at a turning point.