

Vertex Vision

Graph absolute value functions and find their key features.

HIGH SCHOOL • MA.912.AR.4.3

MA.912.AR.4.3 "Given a table, equation or written description of an absolute value function, graph that function and determine its key features."

NAME _____

DATE _____

READ THE V

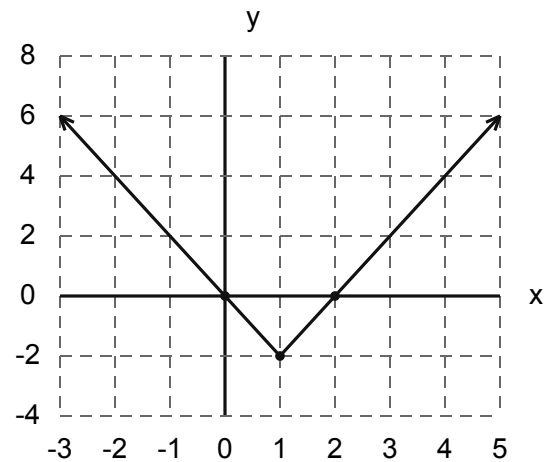
For $y=a|x-h|+k$, the vertex is (h,k) and symmetry axis is $x=h$. Use a ruler for the two straight branches and sharp vertex. For a restricted domain, draw only the allowed portion. Find intercepts by setting $x=0$ or $y=0$. State where the graph rises, falls or is above/below the x -axis. Unless constrained, its domain is all real numbers ($\mathbb{R}$).

WORKED EXAMPLE

Graph $y=2|x-1|-2$. State the vertex, symmetry, intercepts and range.

1. The vertex is $(1,-2)$; plot $(0,0),(2,0)$ on its two sides.
2. Draw two straight rays meeting at the vertex, with arrows.
3. The minimum is -2 ; domain $\mathbb{R}$, range $y \geq -2$.

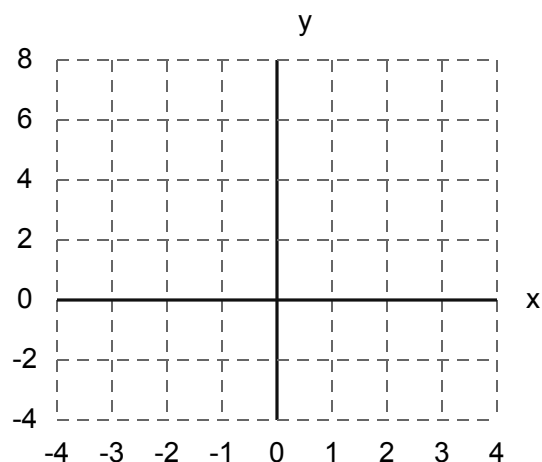
Answer: Vertex $(1,-2)$; axis $x=1$; x-intercepts $(0,0),(2,0)$; y-intercept $(0,0)$; domain $\mathbb{R}$; range $y \geq -2$.



PRACTICE 4 problems

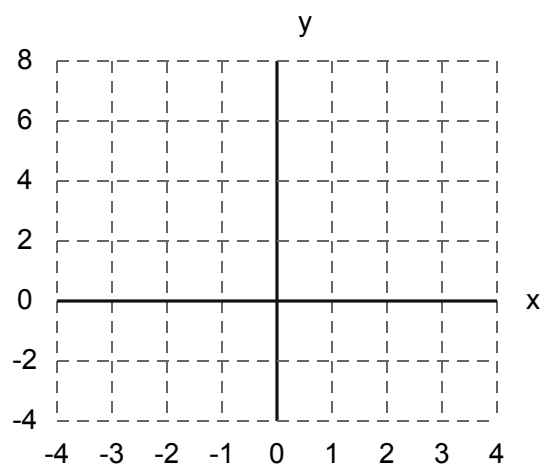
- 1** Graph $y = -2|x+1|+4$. Give its vertex, axis, maximum, range and both x-intercepts.

ANSWER _____



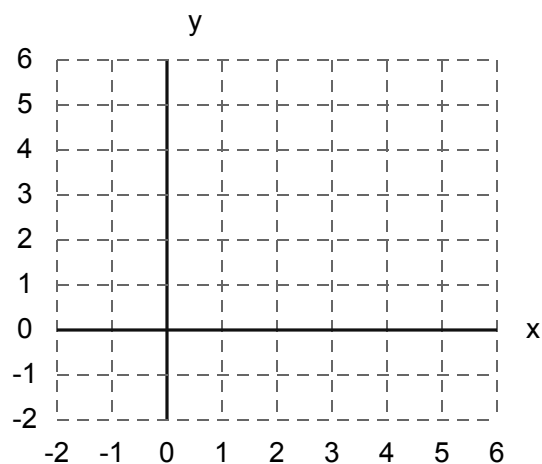
- 2** A table gives $x = -2, -1, 0, 1, 2$ and $y = 4, 2, 0, 2, 4$. Write and graph the absolute-value function. Give its vertex, domain and range.

ANSWER _____



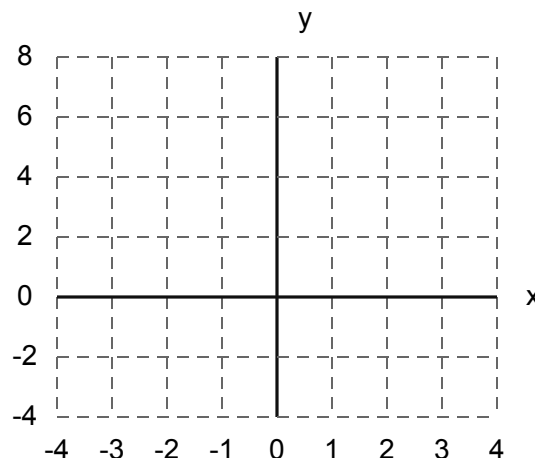
- 3** Graph $y = |x-2|+1$. Give the y-intercept, any x-intercepts, and the intervals where it increases/decreases.

ANSWER _____



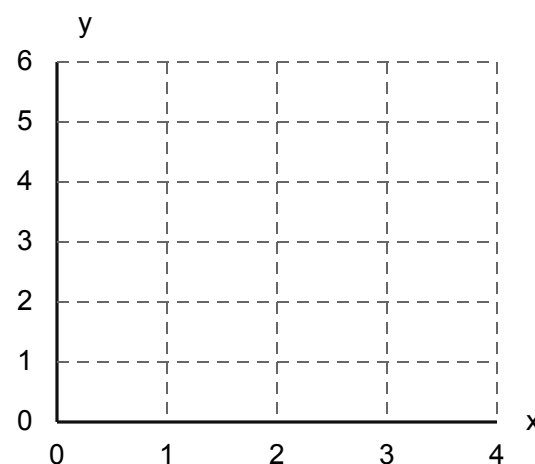
- 4** A V has vertex $(-1, -2)$, opens up, and passes through $(0, -1)$. Write and graph it. Give positive/negative intervals and end behavior.

ANSWER _____

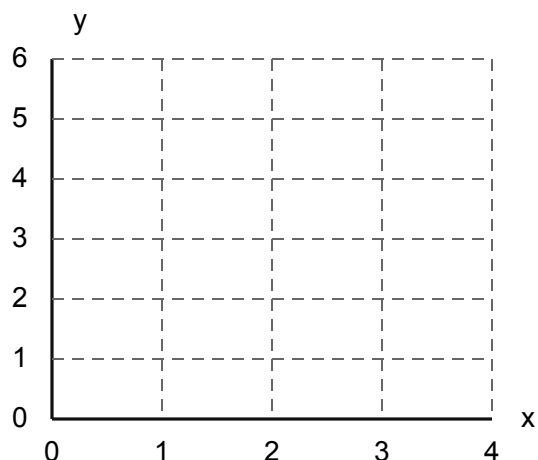


APPLY IT Show your work

- 1** A cyclist is $y = |x - 1| + 1$ blocks from school x hours after 3 p.m., for $0 \leq x \leq 4$. Graph the trip. When and how close is the cyclist nearest school? State domain and range.



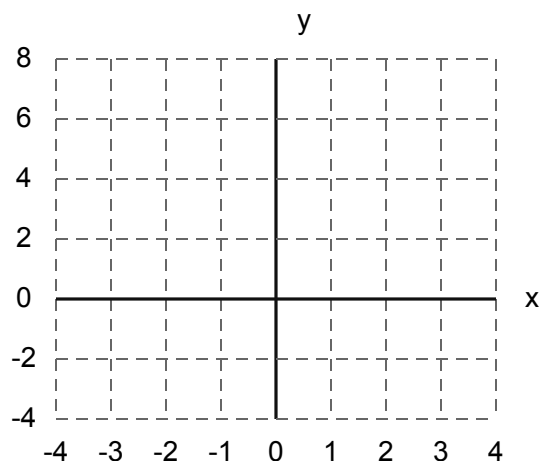
- 2** A roof profile has height $y=4-|x-2|$ meters for $0 \leq x \leq 4$ meters across the building. Graph it. Give vertex, symmetry, maximum height and range.



CHALLENGE One step up

Graph $y=|x|-2$. A drawing rounds off its bottom like a U. Explain why that is wrong. State domain, range, zeros, and intervals where the function is positive or negative.

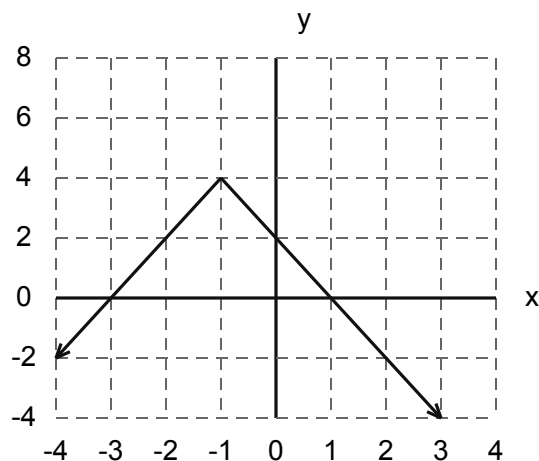
WORK SPACE AND ANSWER



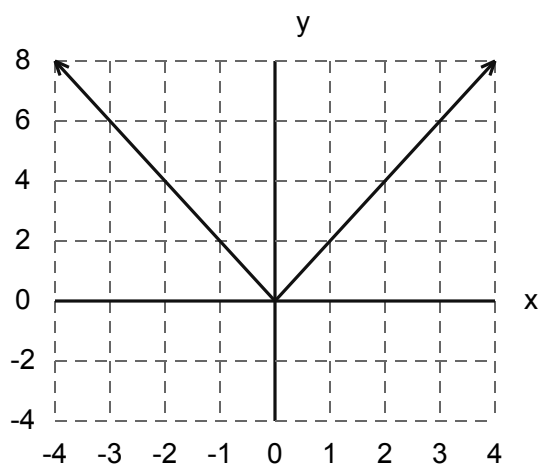
Require sharp vertices and straight rays. Do not smooth absolute-value graphs like parabolas. Zeros are excluded from positive/negative intervals. Unrestricted graphs have arrows; cyclist and roof graphs stop at their specified domains. Accept equivalent inequality or set-builder notation.

PRACTICE 1

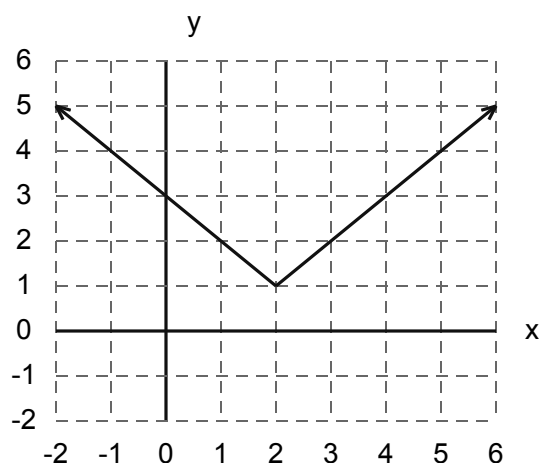
$V=(-1,4)$; axis $x=-1$; maximum 4; range $y \leq 4$; x-intercepts $(-3,0), (1,0)$.

**PRACTICE 2**

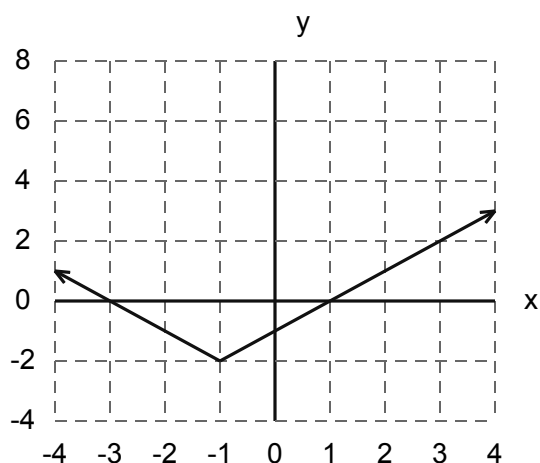
$y=2|x|$; $V=(0,0)$; $D=\mathbb{R}$; range $y \geq 0$.

**PRACTICE 3**

y-intercept $(0,3)$; no x-intercepts. Decreasing $x < 2$; increasing $x > 2$.

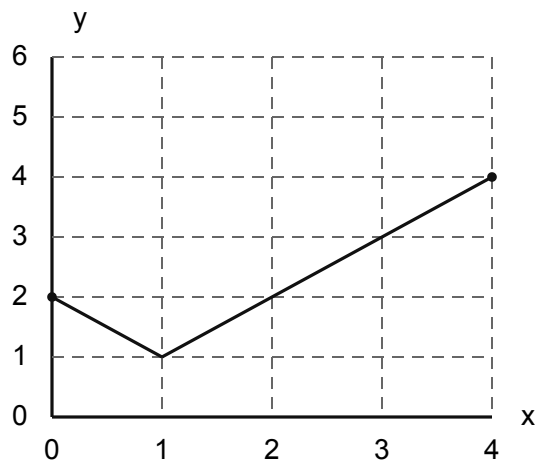
**PRACTICE 4**

$y=|x+1|-2$. Positive $x < -3$ or $x > 1$; negative $-3 < x < 1$. Both ends rise without bound.



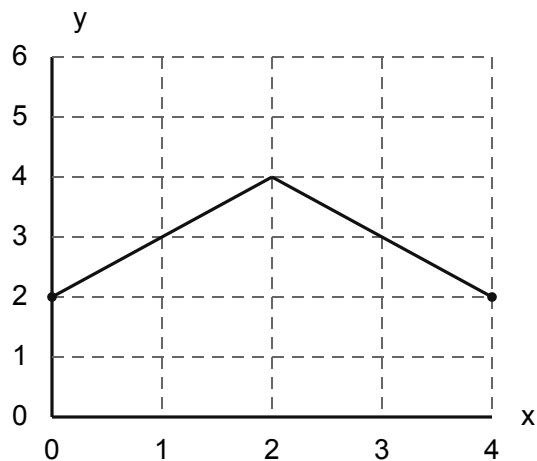
APPLY IT 1

Nearest at 4 p.m., 1 block away. Domain $0 \leq x \leq 4$; range $1 \leq y \leq 4$.
 $x=1$ means one hour after 3 p.m.



APPLY IT 2

$V=(2,4)$; axis $x=2$; maximum 4 m; range $2 \leq y \leq 4$.
 The two straight roof slopes meet at the peak.



CHALLENGE

Two straight rays meet sharply at $(0, -2)$. $D=\mathbb{R}$; $y \geq -2$;
 zeros $-2, 2$. Positive $x < -2$ or $x > 2$; negative $-2 < x < 2$.

