

Graph Feature Hunt

Draw functions and use their graphs to explain key features.

HIGH SCHOOL • HSF-IF.C.7

CCSS.Math.Content.HSF-IF.C.7 "Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. *"

NAME _____

DATE _____

You will need: Pencil and ruler; Graphing calculator or graphing software for Apply It 2

A GRAPH RECORDS INPUT-OUTPUT PAIRS

For simple functions, find intercepts and useful points, then draw the appropriate line or curve by hand. Mark turning points and symmetry when present. For a complicated function, use graphing technology, record its window, and verify key features numerically. Grid windows show only part of an unrestricted graph.

WORKED EXAMPLE

Graph $g(x) = -x + 3$ by hand and identify its intercepts and behavior.



— $g(x) = -x + 3$

1. At $x = 0$, $g(x) = 3$. At $y = 0$, $x = 3$. Plot (0,3) and (3,0), then draw the line through them.
2. Its slope is -1, so it decreases as x increases. The line continues beyond this window.

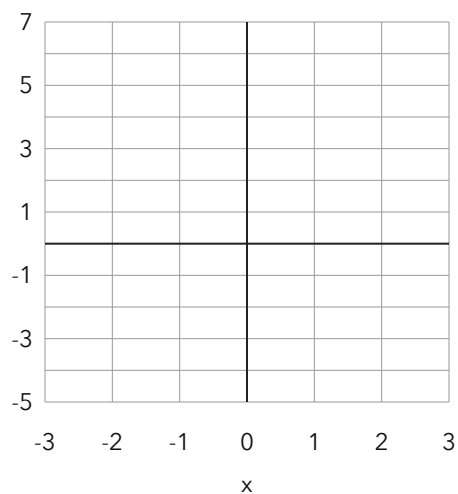
Answer: x-intercept (3,0); y-intercept (0,3); decreasing on all real x .

PRACTICE 4 problems

- 1** By hand, graph $f(x) = 2x + 1$. Label both intercepts and state where the function increases or decreases.

ANSWER _____

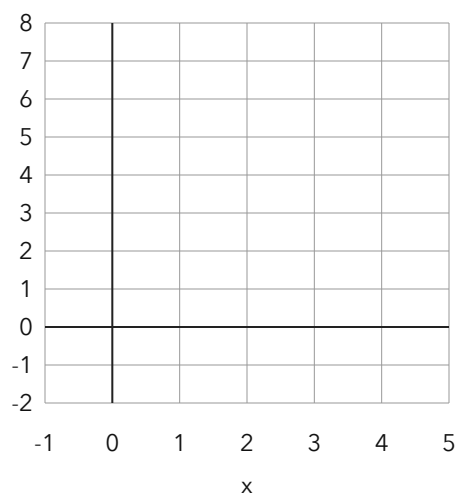
y



- 2** By hand, graph $h(x) = x^2 - 4x + 3$. Label both x-intercepts, the vertex, and the y-intercept. Draw its axis of symmetry as a dashed line.

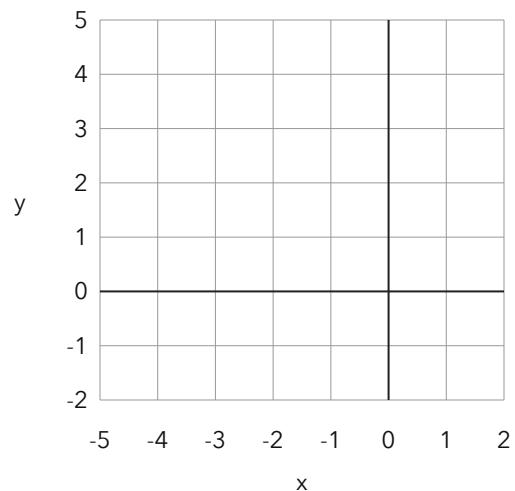
ANSWER _____

y



- 3** By hand, graph $p(x) = |x + 2| - 1$. Label its vertex and intercepts. State its range.

ANSWER _____



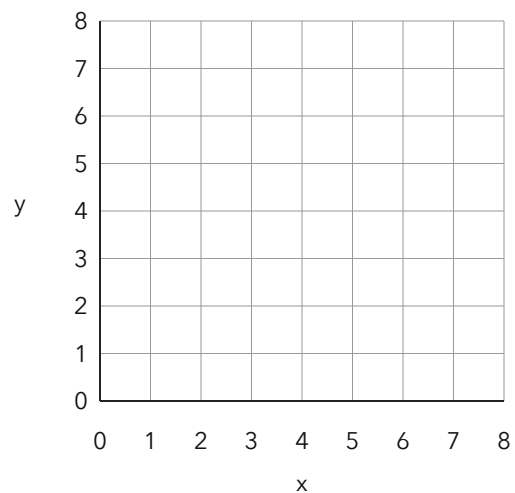
- 4** Use your Practice 2 graph. State where h decreases and increases, its minimum value, and where $h(x) < 0$. Explain how the graph shows the last answer.

ANSWER _____

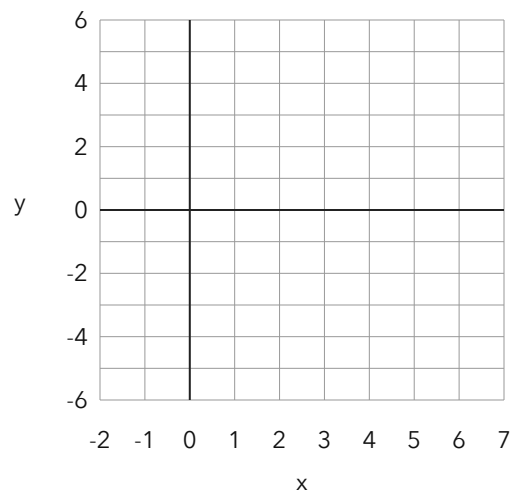
APPLY IT Show your work

- 1** A battery model is $B(t) = 8 - t$ for $0 \leq t \leq 8$ hours. B is measured in tens of percentage points. Graph only this domain. Label both endpoints and explain their meanings.

REASONING AND ANSWER

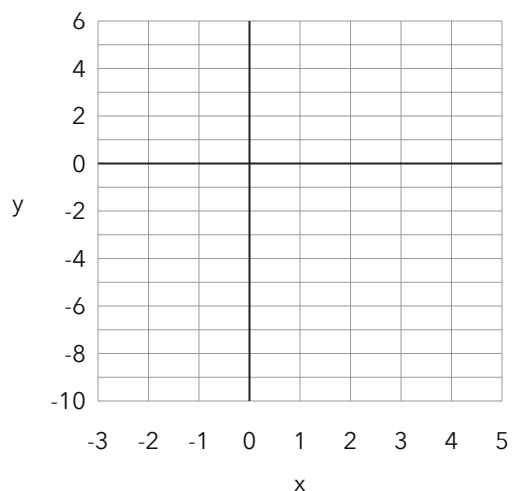


- 2 Use graphing technology for $F(x) = 0.3x^3 - 1.7x^2 + 0.4x + 2$. Start with $-2 \leq x \leq 7$ and $-6 \leq y \leq 6$. Sketch the graph here. Record the three x-intercepts and two turning points to the nearest tenth; identify the y-intercept.

REASONING AND ANSWER**CHALLENGE** One step up

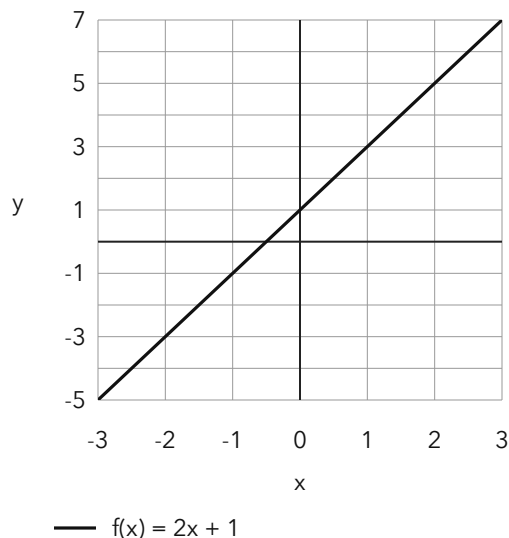
For $q(x) = x^2 - 2x - 8$, draw the graph by hand. Label its vertex and intercepts. State its range and explain how the vertex determines it.

WORK SPACE AND ANSWER



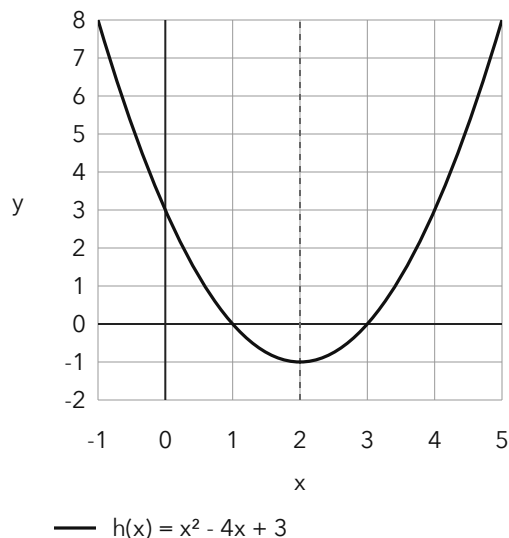
PRACTICE 1

Intercepts $(-1/2, 0)$ and $(0, 1)$; increasing for all real x .



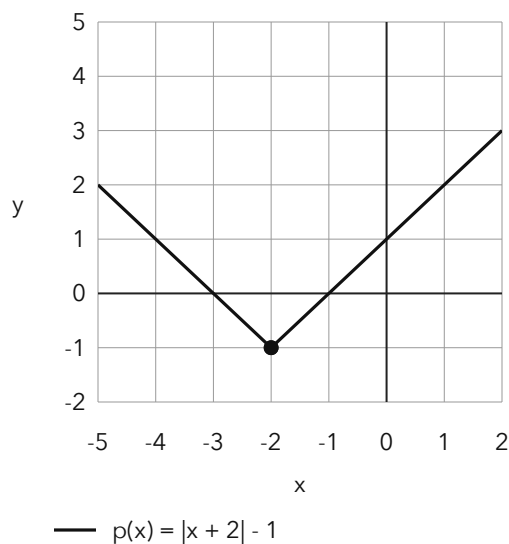
PRACTICE 2

$(1, 0)$, $(3, 0)$, vertex $(2, -1)$, y-intercept $(0, 3)$; axis $x = 2$.



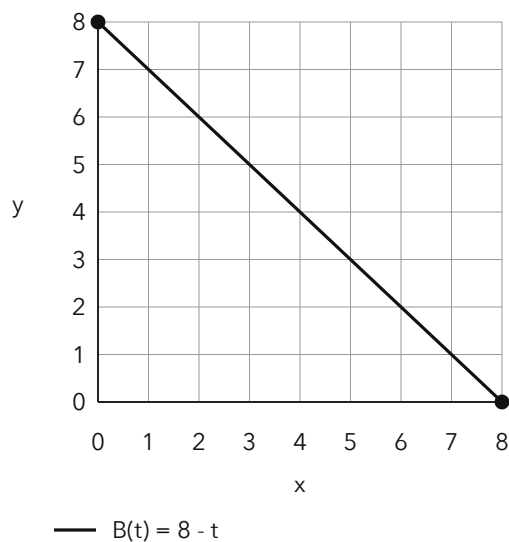
PRACTICE 3

Vertex $(-2, -1)$; intercepts $(-3, 0)$, $(-1, 0)$, $(0, 1)$. Range $y \geq -1$.



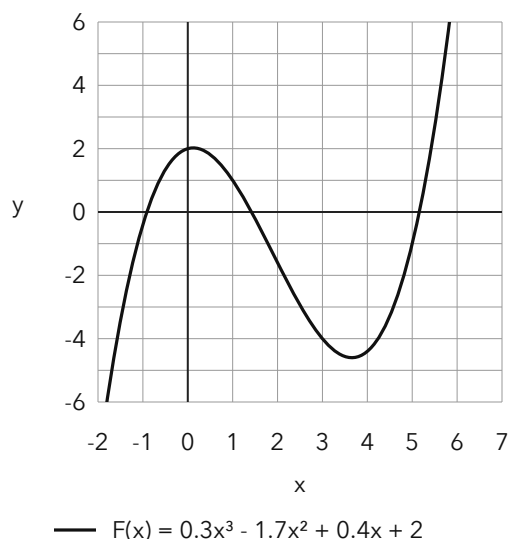
APPLY IT 1

Endpoints $(0, 8)$ and $(8, 0)$: the battery starts at 80% and reaches 0% after 8 hours. Plot the line segment from $(0, 8)$ to $(8, 0)$, with both endpoints included. Each hour loses 10 percentage points.



APPLY IT 2

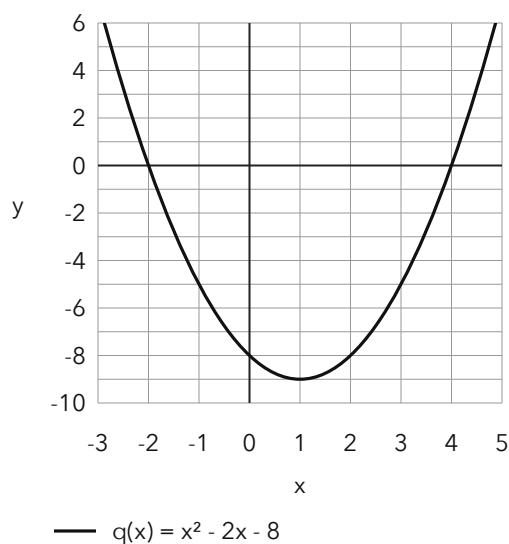
x-intercepts $\approx (-0.9, 0)$, $(1.4, 0)$, $(5.2, 0)$. Local maximum $\approx (0.1, 2.0)$; local minimum $\approx (3.7, -4.6)$. y-intercept $(0, 2)$. Use technology's zero and extremum tools, then check by substitution or a value table. The cubic rises to the first turning point, falls to the second, and rises afterward.



CHALLENGE

Vertex $(1, -9)$; intercepts $(-2, 0)$, $(4, 0)$, $(0, -8)$. Range $y \geq -9$ because the parabola opens upward from its minimum.

Require actual graphs as well as feature labels. Accept equivalent interval descriptions and reasonable hand-drawn curves. Teacher plots supply shapes; adjacent text supplies feature coordinates for labeling. On the battery grid, x denotes t and y denotes B . Technology is required only for Apply It 2; its stated window may be enlarged if helpful.



PRACTICE 4

Decreases for $x < 2$; increases for $x > 2$; minimum -1 at $x = 2$. $h(x) < 0$ for $1 < x < 3$ because the curve lies below the x -axis between its roots.