

Line Feature Lab

Graph linear functions and read what their features mean.

HIGH SCHOOL • MA.912.AR.2.4

MA.912.AR.2.4 "Given a table, equation or written description of a linear function, graph that function, and determine and interpret its key features."

NAME _____

DATE _____

GRAPH AND READ

In $f(x)=mx+b$, m is the slope and b is the vertical intercept. Plot the vertical intercept, then use the slope as rise/run to find another point. Key features include slope, intercepts, and whether the function increases, decreases, or stays constant.

WORKED EXAMPLE

Graph $f(x)=9x+14$. State the slope and vertical intercept.

1. Identify $m=9$ and $b=14$.
2. Plot the vertical intercept at $(0,14)$.
3. Use slope $9/1$ to plot a second point at $(1,23)$.
4. Draw a line through the two points.

Answer: The graph passes through $(0,14)$ and $(1,23)$. The slope is 9, the vertical intercept is $(0,14)$, and the function is increasing.

PRACTICE 6 problems

- 1** Graph $f(x)=-4x+5$. State the slope, both intercepts, and whether the function increases or decreases.

ANSWER _____

- 2** The table shows a linear function. Write its equation, graph it, and state its slope and intercepts. x : -2, -1, 0, 1 $f(x)$: 10, 8, 6, 4

ANSWER _____

- 3** A line crosses the vertical axis at -5 and rises 4 units for every 1 unit it moves right. Write $f(x)$, graph it, and find both intercepts.

ANSWER _____

- 4** Graph $f(x)=1/2x-3$. State the slope, both intercepts, and whether the function increases or decreases.

ANSWER _____

- 5** The equation $2x+f(x)=12$ describes a linear function. Rewrite it in $f(x)=mx+b$ form, graph it, and state its intercepts.

ANSWER _____

- 6** The table shows a linear function. Write its equation, graph it, and describe its key features. x : -3, 0, 2 $f(x)$: -4, -4, -4

ANSWER _____

APPLY IT Show your work

- 1** An art studio charges a \$4 supply fee plus \$6 for each hour you use a digital drawing tablet. Let $f(x)$ be the total cost in dollars for x hours. Write and graph the function for $x \geq 0$. State the slope and vertical intercept, and explain what each means in this situation.

WORK SPACE

ANSWER _____

- 2** A student pays a \$20 booth fee to sell used games at a school event. The student earns \$5 for each game sold. Let $f(x)$ be the profit in dollars after selling x games. Write and graph the function. Find and interpret the horizontal intercept.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A line passes through $(2, -5)$ and $(6, 11)$. Graph the line, write $f(x)$, find both intercepts, and explain how you found the equation.

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Graph $f(x) = -4x + 5$. State the slope, both intercepts, and whether the function increases or decreases.	Points may include (0,5) and (1,1). Slope: -4. Vertical intercept: (0,5). Horizontal intercept: (5/4,0). The function is decreasing.
2	The table shows a linear function. Write its equation, graph it, and state its slope and intercepts. x: -2, -1, 0, 1 f(x): 10, 8, 6, 4	$f(x) = -2x + 6$. Points may include (0,6) and (3,0). Slope: -2. Vertical intercept: (0,6). Horizontal intercept: (3,0). The function is decreasing.
3	A line crosses the vertical axis at -5 and rises 4 units for every 1 unit it moves right. Write $f(x)$, graph it, and find both intercepts.	$f(x) = 4x - 5$. Points may include (0,-5) and (2,3). Slope: 4. Vertical intercept: (0,-5). Horizontal intercept: (5/4,0). The function is increasing.
4	Graph $f(x) = 1/2x - 3$. State the slope, both intercepts, and whether the function increases or decreases.	Points may include (0,-3) and (6,0). Slope: 1/2. Vertical intercept: (0,-3). Horizontal intercept: (6,0). The function is increasing.
5	The equation $2x + f(x) = 12$ describes a linear function. Rewrite it in $f(x) = mx + b$ form, graph it, and state its intercepts.	$f(x) = -2x + 12$. Points may include (0,12) and (6,0). Slope: -2. Vertical intercept: (0,12). Horizontal intercept: (6,0). The function is decreasing.
6	The table shows a linear function. Write its equation, graph it, and describe its key features. x: -3, 0, 2 f(x): -4, -4, -4	$f(x) = -4$. The graph is a horizontal line through points such as (0,-4) and (2,-4). Slope: 0. Vertical intercept: (0,-4). There is no horizontal intercept. The function is constant.

PART 2 · APPLY IT

- $f(x) = 6x + 4$. Graph a ray beginning at (0,4) and passing through (2,16). The slope is 6, meaning the cost increases by \$6 per hour. The vertical intercept is (0,4), meaning the supply fee is \$4. For this situation, $x \geq 0$ and $f(x) \geq 4$.** Multiply the hourly rate by x and add the one-time fee. Since time cannot be negative, graph only the part of the line where x is at least 0.
- $f(x) = 5x - 20$. Points may include (0,-20) and (4,0). The horizontal intercept is (4,0), so the student breaks even after selling 4 games. The vertical intercept is (0,-20), which represents the booth fee before any games are sold.** The booth fee is the starting profit, so it is negative. Set $f(x)$ equal to 0 to find the number of games needed to break even.

CHALLENGE

Slope = $(11 - (-5)) / (6 - 2) = 16 / 4 = 4$. Using (2,-5), $-5 = 4(2) + b$, so $b = -13$ and $f(x) = 4x - 13$. The vertical intercept is (0,-13), and the horizontal intercept is (13/4,0). The function is increasing. A graph can use the given points (2,-5) and (6,11).

Accept any correct graph with two or more accurate points and a straight line or appropriate ray. Accept equivalent descriptions of vertical and horizontal intercepts, including x-intercept and y-intercept terminology.