

Algebra 1 · Key Features of Graphs and Rate of Change · Worksheet

Common Core F-IF.B.4, F-IF.B.6, F-IF.C.9 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 22 problems practice F-IF.B.4, F-IF.B.6 and F-IF.C.9. You will find intercepts, intervals of increase and decrease, maximum and minimum values, end behavior and symmetry, then compute average rates of change and compare functions given by equations, tables and graphs.

Problems move from reading simple graphs to word problems about speed, tides, tanks and memberships. Always include units when the context has them.

Algebra 1 Common Core: F-IF.B.4 · F-IF.B.6 · F-IF.C.9

Problem 1: Intercepts of a line

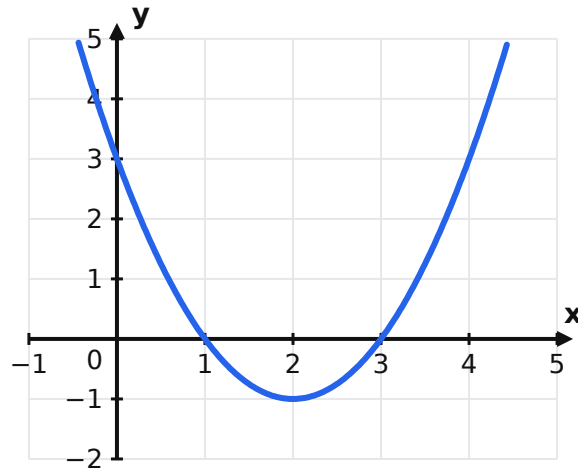
Find the x -intercept and the y -intercept of $f(x) = 2x - 6$.

Problem 2: Intercepts of a parabola

Find the intercepts of $g(x) = x^2 - 9$.

Problem 3: Features from a graph

Use the graph to find the x -intercepts, the y -intercept, the vertex and the axis of symmetry. Is the vertex a maximum or a minimum?



The graph of $f(x) = x^2 - 4x + 3$.

Problem 4: Intercepts from a table

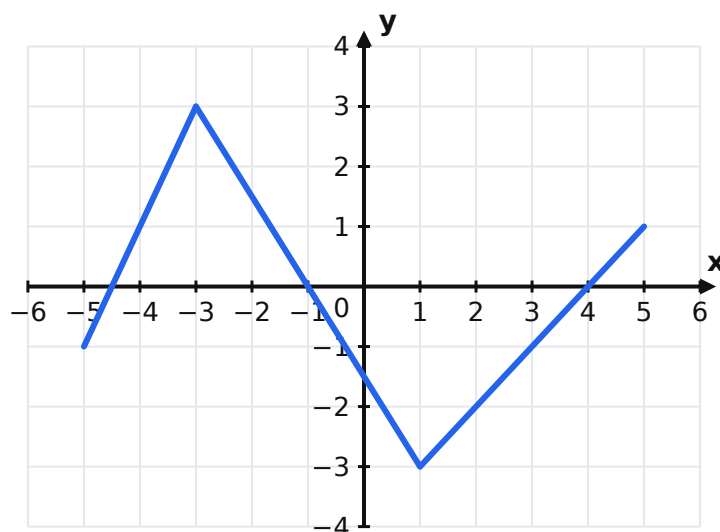
The table shows a linear function f . Find the y -intercept and the x -intercept. Is f increasing or decreasing?

x	0	1	2	3	4
$f(x)$	12	8	4	0	-4

A table of values for a linear function.

Problem 5: Increasing and decreasing

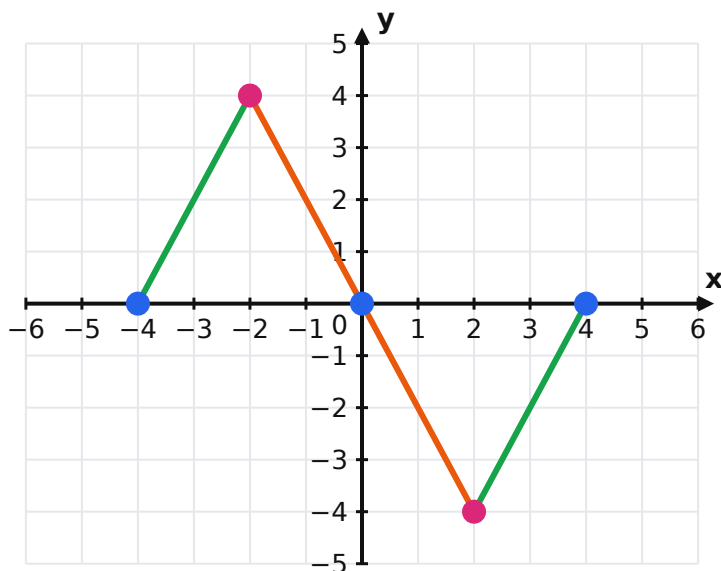
Give the intervals where the function is increasing and decreasing, and give the relative maximum and relative minimum.



A graph made of three line segments.

Problem 6: Positive and negative intervals

The graph shows a function f . Find the x -intercepts, the interval where f is positive, and the interval where f is negative.



Green parts rise, the orange part falls. The turning points are a relative maximum and a relative minimum.

Problem 7: Axis of symmetry and vertex

For $f(x) = x^2 - 6x + 5$, find the axis of symmetry and the vertex. Then find the point symmetric to the y -intercept.

Problem 8: Features of an absolute value function

List the vertex, the intercepts, the intervals of increase and decrease, and the line of symmetry for $f(x) = |x - 2| - 3$.

Problem 9: Maximum of a quadratic

For $f(x) = -x^2 + 4x + 1$, find the vertex, the maximum value, the y -intercept and the intervals of increase and decrease.

Problem 10: End behavior

Describe the end behavior of each function: what happens to $f(x)$ as x gets very large, and as x gets very negative?

- a. $f(x) = -2x + 5$
- b. $g(x) = x^2 + 1$
- c. $h(x) = 3^x$

Problem 11: Average rate of change: squares

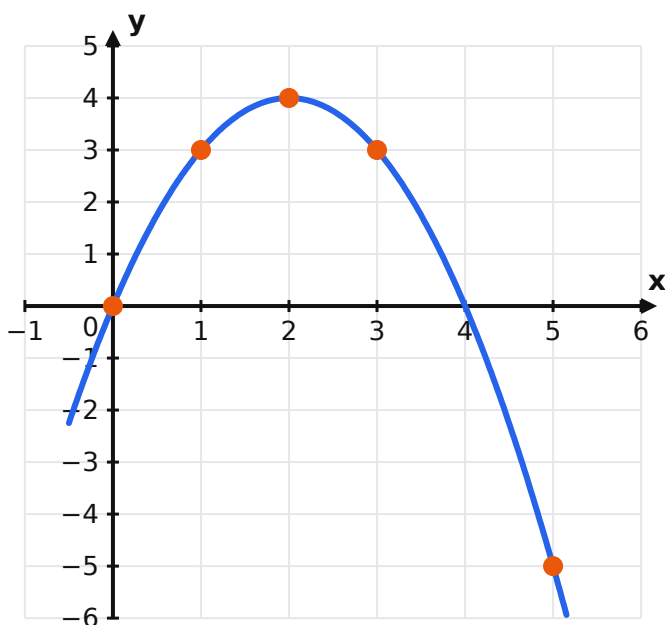
Find the average rate of change of $f(x) = x^2$ from $x = 1$ to $x = 4$.

Problem 12: A rate of change of zero

Find the average rate of change of $f(x) = x^2 - 2x$ from $x = -1$ to $x = 3$. Explain why the answer can be zero even though the function is not constant.

Problem 13: Average rate of change from a graph

Use the points on the graph to find the average rate of change from $x = 0$ to $x = 2$, from $x = 2$ to $x = 5$, and from $x = 1$ to $x = 3$.



The graph of $f(x) = -x^2 + 4x$ with points at $x = 0, 1, 2, 3, 5$.

Problem 14: Rate of change of an exponential

Find the average rate of change of $f(x) = 2^x$ from $x = 1$ to $x = 3$ and from $x = 3$ to $x = 5$. What do the results show?

Problem 15: Equation versus table

Function f is $f(x) = 3x - 2$. Function g is given by the table. Which function has the greater

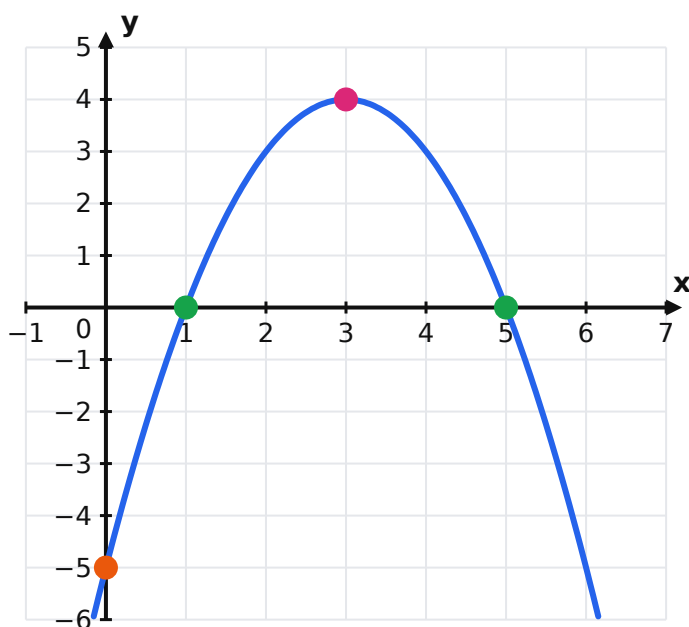
rate of change? Which has the greater y -intercept? Which has the greater value at $x = 10$?

x	0	1	2	3
$g(x)$	1	5	9	13

Values of g .

Problem 16: Equation versus graph

Function f is $f(x) = -x^2 + 9$. Function g is shown in the graph. Compare the two: which has the greater maximum value, which has the greater y -intercept, and what are the x -intercepts of each?



The graph of a function g .

Problem 17: Ball height features

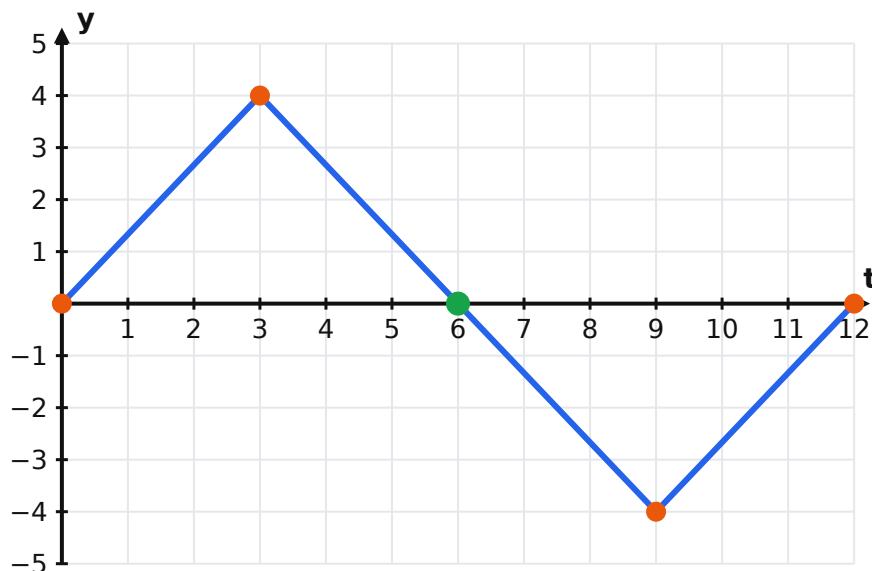
A ball is hit upward. Its height in feet after t seconds is $h(t) = -16t^2 + 64t + 5$. Find the y -intercept and explain it. Find when the ball is highest and how high it gets. Find the average rate of change from $t = 0$ to $t = 2$.

Problem 18: Draining a tank

Water drains from a tank so that $V(t) = 120 - 8t$ gives the gallons left after t minutes. Find the intercepts and explain each. What is the rate of change, and what does it mean? State a reasonable domain.

Problem 19: Tide chart

The graph shows the water level at a dock, in feet above or below the dock level, t hours after midnight. When is the water above the dock? When is the level increasing? What are the relative maximum and minimum? Find the average rate of change from $t = 3$ to $t = 9$.



Water level in feet above (+) or below (–) the dock, t hours after midnight.

Problem 20: Road trip speeds

The table shows how many miles the Garcia family had driven t hours after leaving home. Find the average speed from $t = 0$ to $t = 4$, from $t = 1$ to $t = 3$, and from $t = 2$ to $t = 4$. During which of these three intervals was the average speed lowest?

t (h)	0	1	2	3	4
d (mi)	0	62	118	180	230

Distance driven over time.

Problem 21: Gym memberships

Gym A charges $C_A(m) = 20m + 50$ dollars for m months. Gym B costs \$45, \$90, \$135, \$180 after 1, 2, 3, 4 months. Compare the rates of change. Find the cost of each after 1, 2 and 6 months. For which numbers of months is Gym A cheaper?

Problem 22: Exponential versus linear growth

Let $F(x) = 2^x$ and $G(x) = 10x$. Complete the comparison: find the average rate of change of

each function from $x=0$ to $x=4$ and from $x=0$ to $x=6$. Which function has the greater rate on each interval?

x	0	1	2	3	4	5	6
F(x)	1	2	4	8	16	32	64
G(x)	0	10	20	30	40	50	60

Values of F and G .