

Interpreting and Comparing Functions in Context

Grade 11 – Algebra 2 math · Lesson · Standards: F-IF.B.4, F-IF.B.5, F-IF.B.6, F-IF.C.8a, F-IF.C.9

Quick answer: To interpret a function, read its features: intercepts, maximum or minimum, intervals of increase, asymptotes and a domain that fits the situation. The average rate of change from a to b is $(f(b) - f(a)) \div (b - a)$, the slope of a secant line. Completing the square reveals the vertex of a quadratic, and factoring reveals its zeros.

Standards: F-IF.B.4, F-IF.B.5, F-IF.B.6, F-IF.C.8a, F-IF.C.9 · **Level:** Grade 11 Algebra 2

How do you read key features of a function in context?

Key features include intercepts, intervals where the function increases or decreases, maximum and minimum values, symmetry, end behavior and asymptotes. In a story, each feature has a meaning: the y -intercept is the starting value, and a zero is a time or amount when the output reaches 0.

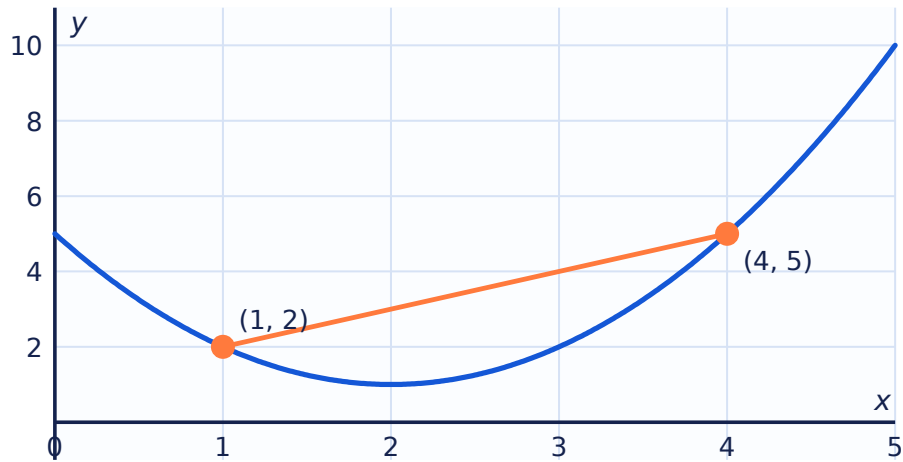
The domain must also make sense in context. A ball's height $h(t) = -16t^2 + 64t$ is a polynomial defined for all real t , but the ball is in flight only for $0 \leq t \leq 4$.

What is the average rate of change?

Average rate of change

$$(f(b) - f(a)) \div (b - a)$$

It is the slope of the secant line through $(a, f(a))$ and $(b, f(b))$.



The average rate of change from $x = 1$ to $x = 4$ is the slope of the orange secant line: $(5 - 2)/(4 - 1) = 1$.

Example

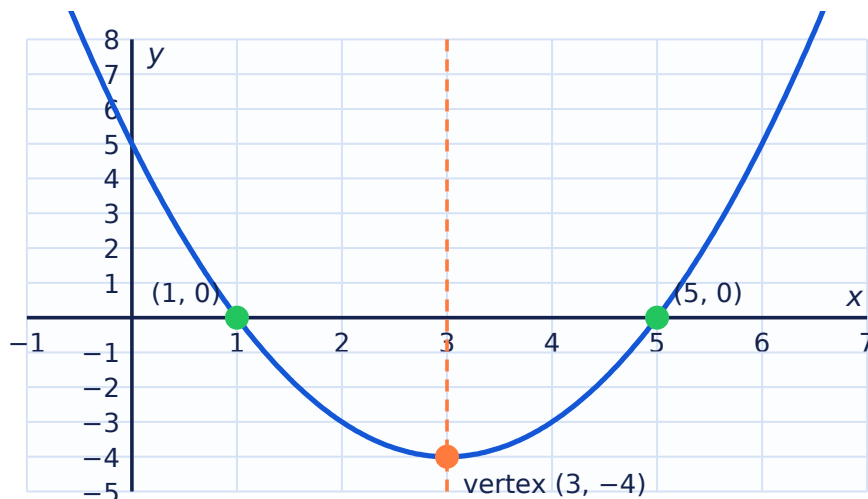
For $f(x) = x^2 - 4x + 5$ on $[1, 4]$: $f(1) = 2$ and $f(4) = 5$, so the rate is $(5 - 2) \div 3 = 1$. It works the same from a table or a graph: read two points and divide.

How do factored and vertex forms reveal features?

Method: completing the square

1. Factor out the leading coefficient from the x^2 and x terms.
2. Add and subtract the square of half the x -coefficient.
3. Write the result as $a(x - h)^2 + k$.

Vertex form gives the extreme value k and the axis $x = h$. Factored form $a(x - p)(x - q)$ gives the zeros p and q .



Vertex form shows the minimum; factored form shows the zeros; the axis of symmetry is halfway between them.

How do you compare two functions?

Find the same feature for each: starting value, rate of change, maximum, or long-run behavior. Exponential functions eventually outgrow any linear or polynomial function, even when they start smaller.

Representation	Plan A (equation)	Plan B (table)
Rule	$C = 20 + 0.15m$ m: 0, 100, 200 → C: 12, 27,	
Starting cost	\$20	\$12
Rate	\$0.15 per minute	\$0.15 per minute

Two phone plans in different representations.

Common mistake

Using the function value instead of the change in value. Average rate of change divides a difference by a difference.

Mathbot's tip

Always attach units to a rate: “dollars per minute,” “feet per second.” The units tell you whether the answer makes sense.

Key points to remember

- The average rate of change from a to b equals $(f(b) - f(a))/(b - a)$.
- Vertex form $a(x - h)^2 + k$ shows the extreme value k and axis $x = h$.
- Factored form shows the zeros of a quadratic.
- The domain in context may be smaller than the domain of the formula.
- To compare functions given as equations, tables or graphs, compare the same feature of each.

Interpreting and Comparing Functions in Context: frequently asked questions

Is average rate of change the same as slope?

For a line they are equal. For a curve, the average rate of change over an interval is the slope of the secant line through the two endpoints, and it varies from interval to interval.

How do I find the maximum of a quadratic model?

Complete the square to write the function as $a(x - h)^2 + k$ with a negative. The maximum value is k and it occurs at $x = h$. You can also use the midpoint of the zeros.

Why can the domain in context differ from the formula's domain?

A formula may accept any real number, but a situation may limit inputs. Time cannot be negative, and a length must be positive, so the context-based domain is often an interval.

How do I compare a table and an equation?

Compute the same feature for both, such as the value at $x = 0$ and the average rate of change over the same interval. Then compare the numbers with units.

What does an asymptote mean in a real situation?

It describes a limit that the output approaches but does not reach. For an average cost function, the horizontal asymptote is the cost per item as production becomes very large.