

Interpreting and Comparing Functions in Context

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

Each solution states the feature and the arithmetic. Check units on every rate, and test any extreme value by substituting it back into the original function.

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Problem 1 Domain in context

Set $h(t) = 0$: $-16t(t - 4) = 0$, so $t = 0$ or 4. The ball is in the air from 0 to 4 seconds. **Lands at $t = 4$; domain $0 \leq t \leq 4$.**

Problem 2 Average rate of change from an equation

$s(1) = 3$ and $s(4) = 72$. Rate = $(72 - 3)/(4 - 1) = 69/3$. **23 feet per second.**

Problem 3 Interpret a linear model

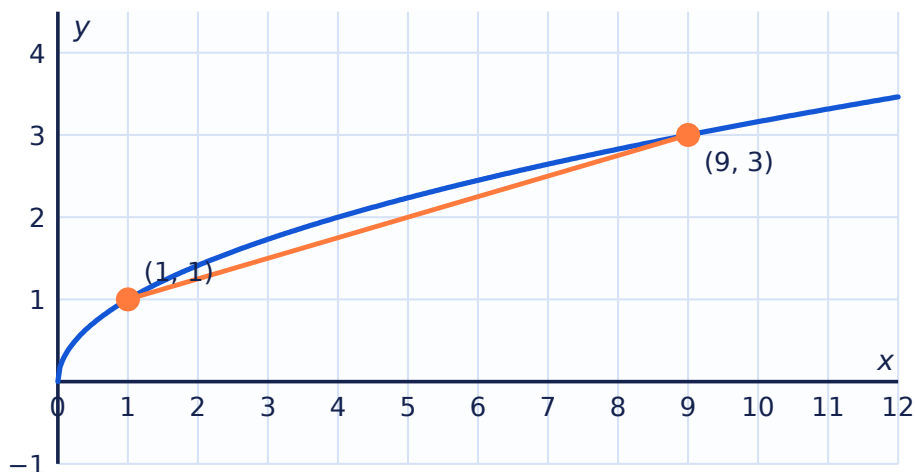
640 is the starting volume in gallons, and -16 means the tank loses 16 gallons every minute. Solve $640 - 16t = 200$: $16t = 440$, so $t = 27.5$. **Starts at 640 gal; drains 16 gal/min; 200 gal remain at 27.5 min.**

Problem 4 Average rate of change from a table

From 2 to 5: $(26 - 11)/(5 - 2) = 5$. From 5 to 9: $(50 - 26)/(9 - 5) = 24/4 = 6$. **5 miles per minute, then 6 miles per minute; the second interval is greater.**

Problem 5 Average rate of change from a graph

The points are (1, 1) and (9, 3). Rate = $(3 - 1)/(9 - 1) = 2/8$. **1/4.**



The secant slope is $1/4$.

Problem 6 Complete the square

Half of 6 is 3, so $x^2 + 6x + 9 - 9 + 5 = (x + 3)^2 - 4$. **$(x + 3)^2 - 4$; vertex $(-3, -4)$.**

Problem 7 Zeros, axis and minimum

$(x - 2)(x - 5)$, so zeros 2 and 5. The axis is midway: $x = 3.5$. $f(3.5) = 12.25 - 24.5 + 10 = -2.25$. **Zeros 2 and 5; axis $x = 3.5$; minimum -2.25 .**

Problem 8 Maximum height

$-16(t^2 - 3t) + 6 = -16(t^2 - 3t + 2.25) + 36 + 6 = -16(t - 1.5)^2 + 42$. **Maximum 42 ft at $t = 1.5$ s.**

Problem 9 Revenue model

Factor: $-6p(p - 28)$, zeros 0 and 28. The vertex is at $p = 14$, and $R(14) = -1176 + 2352 = 1176$. Revenue is nonnegative for $0 \leq p \leq 28$. **Price \$14; maximum \$1,176; domain $0 \leq p \leq 28$.**

Problem 10 Exponential decay features

$f(0) = 250$. The factor 0.8 means a 20% decrease. The asymptote is $y = 0$. $f(3) = 250(0.512) = 128$, so the rate is $(128 - 250)/3 = -40.67$. **250; 20% decrease; $y = 0$; ≈ -40.67 .**

Problem 11 Logarithmic features

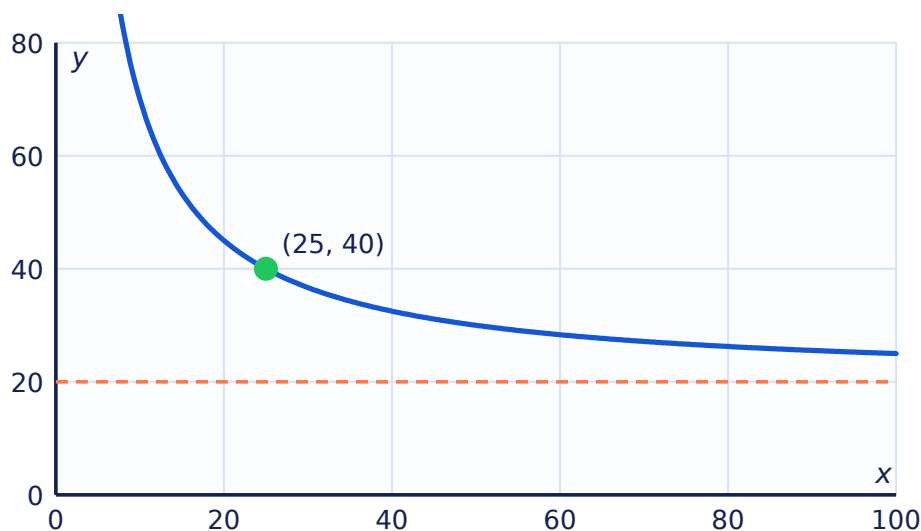
The argument must be positive: $x + 3 > 0$. The asymptote is where it equals 0. For the intercept, $x + 3 = 2^0 = 1$. **Domain $x > -3$; asymptote $x = -3$; intercept $(-2, 0)$.**

Problem 12 Tide features

Period = $2\pi \div (\pi/6) = 12$ hours. Maximum 14 ft and minimum 6 ft. $d(0) = 10$ and $d(3) = 14$, so the rate is $4/3$. **12 h; 14 and 6 ft; ≈ 1.33 ft/h.**

Problem 13 Average cost with an asymptote

Items are counted, so $x > 0$. Since $C(x) = 500/x + 20$, the output approaches 20 for large x : $y = 20$ is the horizontal asymptote, the per-item material cost once the fixed cost of 500 is spread thin. $C(25) = (500 + 500)/25 = 40$. **$x > 0$; $y = 20$; $C(25) = \$40$.**

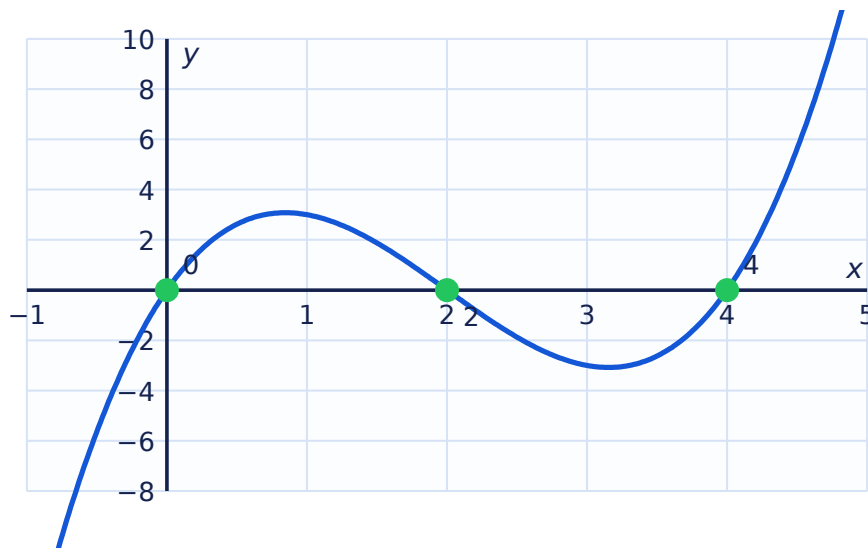


At 25 items the cost is \$40 each.

Problem 14 Features of a cubic

Zeros: 0, 2 and 4. Testing sign: $p(1) = 3 > 0$, $p(3) = -3 < 0$, $p(5) = 15 > 0$, $p(-1) = -15 < 0$.

Zeros 0, 2, 4; positive on (0, 2) and (4, ∞); as $x \rightarrow \infty$, $p \rightarrow \infty$ and as $x \rightarrow -\infty$, $p \rightarrow -\infty$.



The zeros are marked.

Problem 15 Compare a line and a table

$f(0) = 8$ and $g(0) = 5$. The rate of f is 3; for g it is $(9 - 5)/1 = 4$ every step. At $x = 10$: $f = 38$ and $g = 5 + 40 = 45$. **f starts higher, but g grows faster and is larger at $x = 10$ (45 versus 38).**

Problem 16 Compare two quadratics

f has maximum 7 at $x = 2$. For g , the equal outputs 4 at $x = 2$ and $x = 3$ put the axis midway at $x = 2.5$, so its maximum is a little above 4 (it is 4.25). **f has the greater maximum (7 versus about 4.25); g has its axis farther right (2.5 versus 2).**

Problem 17 Population change from a table

2010-2015: $(13,750 - 12,400)/5 = 1350/5 = 270$ people per year. 2015-2020: $(15,900 - 13,750)/5 = 2150/5 = 430$ people per year. **270 then 430 people per year; growth is speeding up.**

Problem 18 Completing the square with a leading coefficient

$3(x^2 - 6x + 9) - 27 + 10 = 3(x - 3)^2 - 17$. Minimum -17 at $x = 3$. Zeros: $(x - 3)^2 = 17/3$, so $x = 3 \pm 2.3805$. **$3(x - 3)^2 - 17$; min -17 ; zeros ≈ 0.62 and 5.38 .**

Problem 19 Exponential versus linear savings

At 10: $A \approx \$1,628.89$, $B = \$2,000.00$. At 20: $A \approx \$2,653.30$, $B = \$2,800.00$. At 30: $A \approx \$4,321.94$, $B = \$3,600.00$. B is ahead at 10 and 20; A is ahead at 30, so the crossing is between 20 and 30, near $t \approx 23$. **A overtakes B after about 23 years.**

Problem 20 Average rate of change of sine

From 0 to $\pi/2$: $(1 - 0)/(\pi/2) = 2/\pi \approx 0.6366$. From $\pi/2$ to π : $(0 - 1)/(\pi/2) = -2/\pi \approx -0.6366$. **≈ 0.64 and ≈ -0.64 : sine is increasing on the first interval and decreasing on the second.**