

Algebra 2 · Rational Functions and Their Graphs · Worksheet Answer Key

Common Core F-IF.C.7d, F-IF.B.4 · mathovore.fr

This algebra 2 rational worksheet answer key solves all 22 problems of the rational functions and their graphs worksheet step by step.

Every solution shows the factoring, the asymptote reasoning and a check. If your graph differs, compare the dashed asymptotes first, then the plotted points on each side of the vertical asymptote.

Algebra 2 Common Core: F-IF.C.7d · F-IF.B.4

Algebra 2 Rational Worksheet Answer Key: problems 1-5

Problem 1: Domain of a rational function

- a. $x+2=0$ at $x=-2$. Domain: $x \neq -2$.
- b. $x-7=0$ at $x=7$. Domain: $x \neq 7$.
- c. $2x-6=0$ gives $x=3$. Domain: $x \neq 3$.
- d. $x^2-25=(x-5)(x+5)$, zero at $x=5$ and $x=-5$. Domain: $x \neq 5$ and $x \neq -5$.

Problem 2: Evaluate a rational function

$$f(-1) = \frac{0}{-3} = 0; f(0) = \frac{1}{-2} = -\frac{1}{2}; f(1) = \frac{2}{-1} = -2; f(3) = \frac{4}{1} = 4; f(5) = \frac{6}{3} = 2.$$

Answers: 0, $-\frac{1}{2}$, -2, 4, 2.

Problem 3: Table for $y = 6/x$

Divide 6 by each x .

x	-6	-3	-2	-1	1	2	3	6
y	-1	-2	-3	-6	6	3	2	1

The points are $(-6,-1), (-3,-2), (-2,-3), (-1,-6), (1,6), (2,3), (3,2), (6,1)$.

Problem 4: Vertical asymptotes

- a. $x+3=0$: $x=-3$.
- b. $x-1=0$: $x=1$.
- c. $x^2-4=(x-2)(x+2)$: $x=2$ and $x=-2$.

d. $x^2+3x=x(x+3)$. Nothing cancels with $x+5$, so $x=0$ and $x=-3$.

Problem 5: Horizontal asymptotes

- a. Equal degrees: $\frac{3}{1}$, so $y=3$.
- b. The numerator has the smaller degree: $y=0$.
- c. Equal degrees: $y=\frac{2}{3}$.
- d. The numerator has the larger degree: **none**.
- e. Equal degrees: $\frac{-4}{2}=-2$, so $y=-2$.

Algebra 2 Rational Worksheet Answer Key: problems 6-10

Problem 6: Intercepts

- a. The numerator is zero when $2x=6$, so the x-intercept is $(3,0)$. $f(0)=\frac{-6}{1}=-6$, so the y-intercept is $(0,-6)$.
- b. $x+4=0$ gives $(-4,0)$. $g(0)=\frac{4}{-2}=-2$, so $(0,-2)$.

Problem 7: Find the hole

- a. $\frac{(x-3)(x+3)}{x-3}=x+3$. At $x=3$ the value is 6: hole $(3,6)$.
- b. $x^2+x-6=(x+3)(x-2)$, so $g(x)=x+3$ for $x \neq 2$. Hole $(2,5)$.
- c. Cancel $x-4$ to get $\frac{x+1}{x+2}$. At $x=4$: $\frac{5}{6}$. Hole $(4, \frac{5}{6})$; the factor $x+2$ gives the vertical asymptote $x=-2$.

Problem 8: Hole, asymptote and end behavior

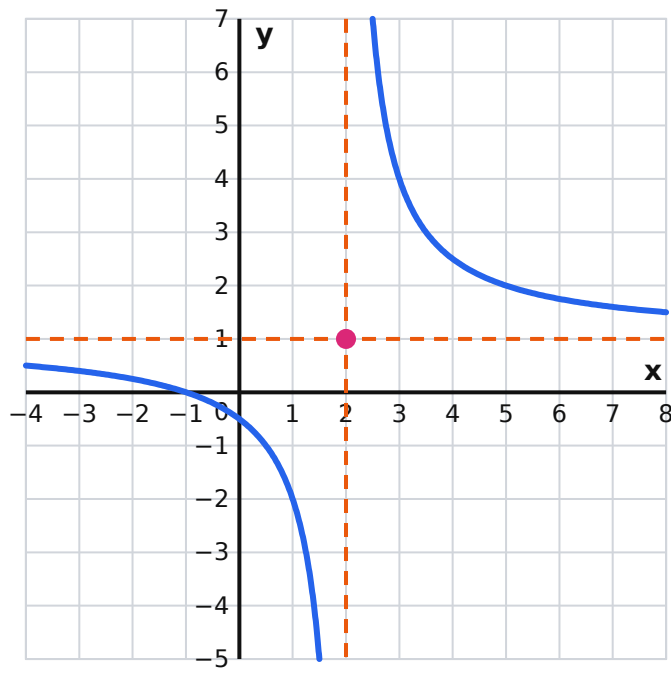
Factor: $f(x)=\frac{(x-1)(x-3)}{(x-1)(x+1)}$. The factor $x-1$ cancels, leaving $\frac{x-3}{x+1}$. At $x=1$ the value is $\frac{-2}{2}=-1$, so the hole is $(1,-1)$. The factor $x+1$ stays: vertical asymptote $x=-1$. Equal degrees with leading coefficients 1 and 1: horizontal asymptote $y=1$.

Problem 9: Shifts of $y = 1/x$

- a. Left 3, down 2. Asymptotes $x=-3$ and $y=-2$.
- b. Reflected over the x-axis, right 5, up 4. Asymptotes $x=5$ and $y=4$.
- c. Up 6 only. Asymptotes $x=0$ and $y=6$.

Problem 10: Read a hyperbola

- a. The branches close in on $x=2$ and $y=1$ (the center is $(2,1)$).
- b. Domain: $x \neq 2$. Range: $y \neq 1$.
- c. Use $h=2$, $k=1$ and the point $(3,4)$: $4=\frac{a}{1}+1$, so $a=3$. Equation: $y=\frac{3}{x-2}+1$. Check $(5,2)$: $\frac{3}{3}+1=2$.

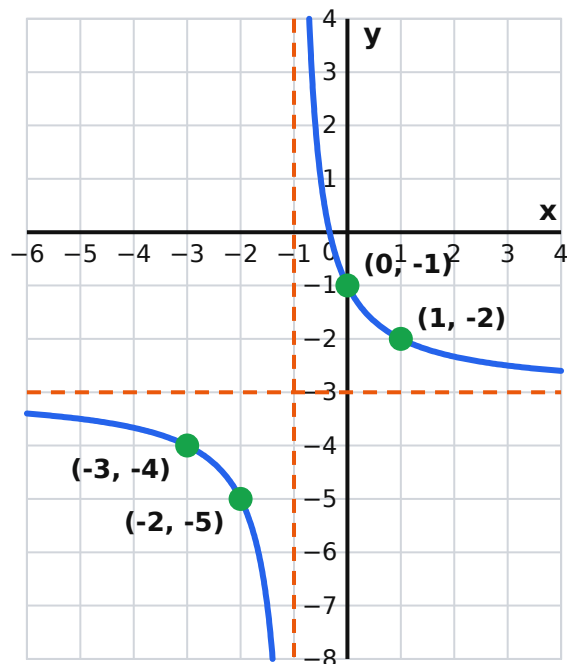


The asymptotes cross at the center $(2, 1)$.

Algebra 2 Rational Worksheet Answer Key: problems 11-15

Problem 11: Graph a rational function

The asymptotes are $x=-1$ and $y=-3$. Points: $x=0$ gives $2-3=-1$; $x=1$ gives $1-3=-2$; $x=-2$ gives $-2-3=-5$; $x=-3$ gives $-1-3=-4$.



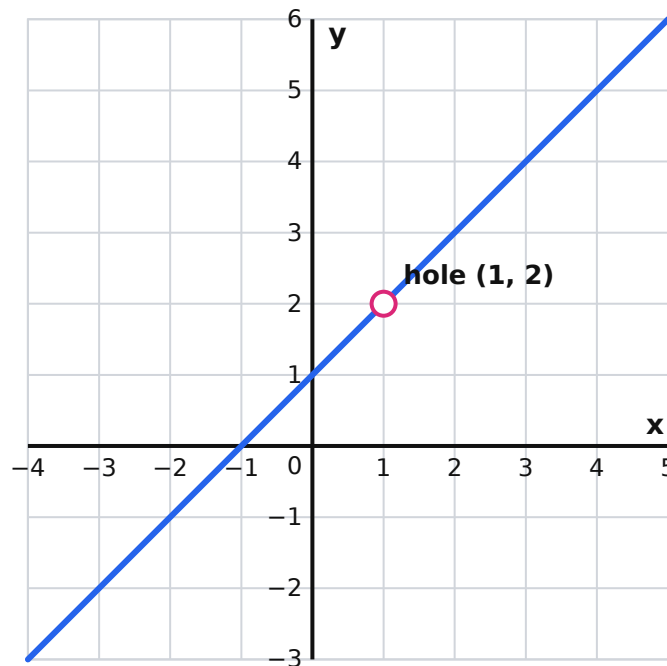
Both branches approach the dashed asymptotes.

Problem 12: Equation from a graph

The dashed lines give $h = -1$ and $k = 2$, so $y = \frac{a}{x+1} + 2$. The point $(0, 5)$ gives $5 = \frac{a}{1} + 2$, so $a = 3$.
Equation: $y = \frac{3}{x+1} + 2$. Check $(2, 3)$: $\frac{3}{3} + 2 = 3$.

Problem 13: A graph with a hole

- $\frac{(x-1)(x+1)}{x-1} = x+1$, so $f(x) = x+1$ for $x \neq 1$.
- At $x = 1$ the line has height 2, so the hole is $(1, 2)$.
- Domain: $x \neq 1$.



The graph is the line $y = x + 1$ with the point $(1, 2)$ removed.

Problem 14: Write a rational function

$h = 2$ and $k = -1$. Substitute $(3, 1)$: $1 = \frac{a}{3-2} - 1$, so $a = 2$. Function: $y = \frac{2}{x-2} - 1$.

Problem 15: Inverse variation constant

- $k = xy = 5 \cdot 8 = 40$, so $y = \frac{40}{x}$.
- $y = \frac{40}{20} = 2$. Answer: $y = 2$.
- $16 = \frac{40}{x}$ gives $x = \frac{40}{16} = \frac{5}{2}$. Answer: $x = 2.5$.

Algebra 2 Rational Worksheet Answer Key: problems 16-20

Problem 16: Is it inverse variation?

- a. Products: 36,36,36,36. Yes, $k = 36$.
- b. Products: 5,20,45,80 are not constant. The ratio $\frac{y}{x} = 5$ is constant, so this is direct variation: **not inverse**.
- c. Products: 60,60,60,60. Yes, $k = 60$.

Problem 17: Inverse variation from a graph

- a. $k = 2 \cdot 12 = 24$ (check $4 \cdot 6 = 24$). Equation: $y = \frac{24}{x}$.
- b. $y = \frac{24}{16} = 1.5$. Answer: $y = 1.5$.

Problem 18: Road trip

- a. $\frac{240}{40} = 6$, $\frac{240}{48} = 5$, $\frac{240}{60} = 4$, $\frac{240}{80} = 3$. Times: **6, 5, 4 and 3 hours**.
- b. $2.5 = \frac{240}{r}$ gives $r = \frac{240}{2.5} = 96$. Speed: **96 mph**.
- c. The asymptote is $t = 0$. Driving faster always shortens the trip, but the time never reaches zero.

Problem 19: Cookie cost

- a. $C(20) = \frac{40}{20} = 2$, $C(60) = \frac{60}{60} = 1$, $C(120) = \frac{90}{120} = 0.75$. Costs: **\$2.00, \$1.00 and \$0.75**.
- b. Split the fraction: $\frac{0.5n}{n} + \frac{30}{n} = 0.5 + \frac{30}{n}$. The asymptote is $C = 0.5$: the average never drops below \$0.50.
- c. $0.5n + 30 = 0.6n$ gives $30 = 0.1n$ and $n = 300$. Check: $\frac{180}{300} = 0.6$. Maya needs **300 cookies**.

Problem 20: Bus rental

- a. $\frac{180}{12} = 15$ and $\frac{180}{20} = 9$. Costs: **\$15 and \$9** per student.
- b. $6 = \frac{180}{n}$ gives $n = 30$. **30 students** are needed.

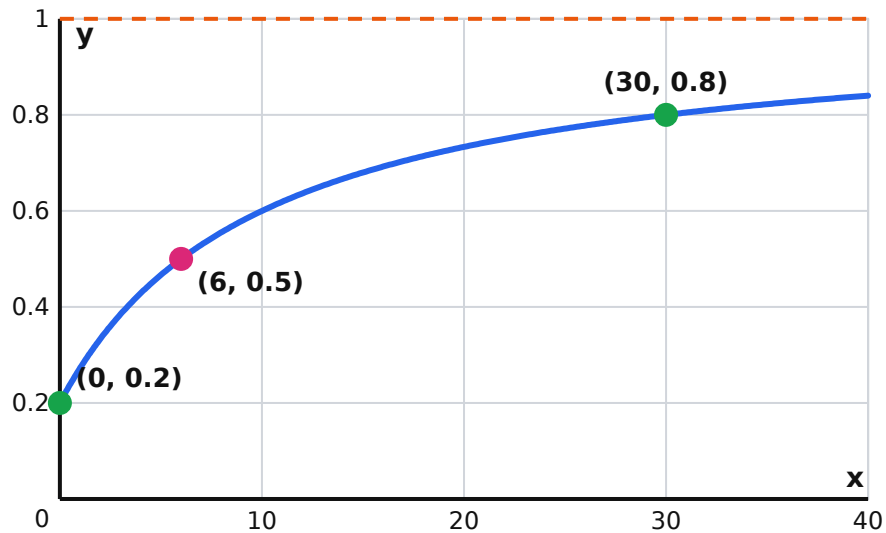
Algebra 2 Rational Worksheet Answer Key: problems 21-22

Problem 21: Bike pump

- a. $k = PV = 15 \cdot 90 = 1350$, so $P = \frac{1350}{V}$.
- b. $P = \frac{1350}{54} = 25$. Pressure: **25 psi**.
- c. $45 = \frac{1350}{V}$ gives $V = 30$. Volume: **30 cubic inches**.

Problem 22: Juice mixture

- a. $c(0) = \frac{2}{10} = 20\%$, $c(10) = \frac{12}{20} = 60\%$, $c(30) = \frac{32}{40} = 80\%$.
- b. $\frac{2+x}{10+x} = \frac{1}{2}$ gives $4 + 2x = 10 + x$, so $x = 6$. Check: $\frac{8}{16} = \frac{1}{2}$. Ethan adds **6 gallons**.
- c. Equal degrees with leading coefficients 1 and 1 give $c = 1$, or 100%. The mixture always contains the original 8 gallons of non-concentrate liquid, so it is never pure concentrate.



The concentration climbs toward 100% but never reaches it.

How to use this algebra 2 rational worksheet answer key

Read this algebra 2 rational worksheet answer key after trying each problem yourself, and redo any problem you missed.

