LESSON MAKER PRO

Rational Function Clues

Read a graph, then check the rule.

HIGH SCHOOL · A2.F.1.6

A2.F.1.6 "Graph a rational function and identify the domain (including holes), range, x- and y-intercepts, vertical and horizontal asymptotes, using various methods and tools that may include a graphing calculator or other appropriate technology..."

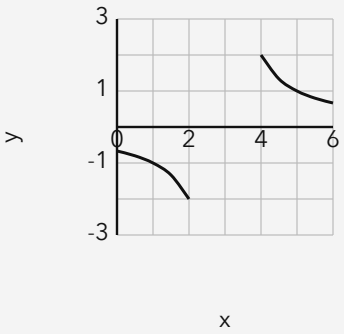
NAME _____ DATE _____

ASYMPTOTES AND HOLES

For y=a/(x-h)+k, x=h is a vertical asymptote and y=k is a horizontal asymptote. Find intercepts by setting y=0 or x=0. If factors cancel, their x-values stay out of the domain and may make holes.

WORKED EXAMPLE

Use the graph of f(x)=2/(x-3). Find the domain, range, intercepts, and asymptotes.



1. The denominator is zero at x=3, so exclude 3 from the domain.
2. The branches approach x=3 and y=0, so those are the asymptotes and 0 is excluded from the range.
3. At x=0, y=-2/3. The numerator is never zero, so there is no x-intercept.

Answer: Domain: x≠3. Range: y≠0. y-intercept: (0, -2/3). No x-intercept. Vertical asymptote: x=3. Horizontal asymptote: y=0.

PRACTICE 4 problems

1 For f(x)=5/(x+1), give the domain and vertical asymptote.

ANSWER _____

2 For f(x)=-4/(x-1)+6, give the range and horizontal asymptote.

ANSWER _____

3 Find both intercepts of f(x)=(x-5)/(x+4).

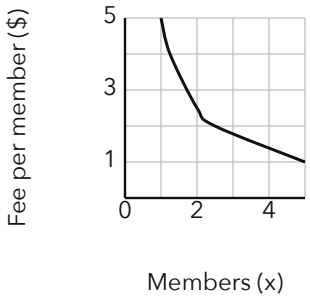
ANSWER _____

4 Find the hole and vertical asymptote of f(x)=(x+7)/((x+7)(x-6)).

ANSWER _____

APPLY IT Show your work

1 A club splits a fixed promo fee equally among its members. Use the graph to find the fee for 1 member and the meaningful domain.



ANSWER _____

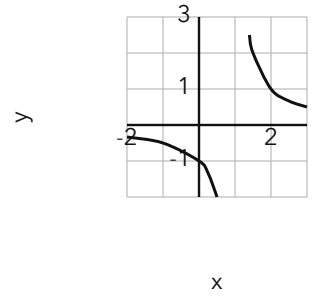
2 A creator's average net earnings per sticker pack are y=4-8/x dollars after selling x packs, where x is a positive whole number. Find the x-intercept and horizontal asymptote. What does each mean?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The graph shows y=1/(x-1). Use it and g(x)=(x+1)/((x+1)(x-1)) to give g's domain, range, hole, and asymptotes.



WORK SPACE AND ANSWER

ANSWER KEY

Rational Function Clues

HIGH SCHOOL · A2.F.1.6

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For f(x)=5/(x+1), give the domain and vertical asymptote.	**Domain: x≠-1. Vertical asymptote: x=-1.**
2	For f(x)=-4/(x-1)+6, give the range and horizontal asymptote.	**Range: y≠6. Horizontal asymptote: y=6.**
3	Find both intercepts of f(x)=(x-5)/(x+4).	**x-intercept: (5, 0). y-intercept: (0, -5/4).**
4	Find the hole and vertical asymptote of f(x)=(x+7)/((x+7)(x-6)).	**Hole: (-7, -1/13). Vertical asymptote: x=6.**

PART 2 · APPLY IT

1. **$5; the meaningful domain is positive whole numbers of members.** Read the graph at x=1. A club can split the fee among 1, 2, 3, or more members, but not zero or a fraction of a member.
2. **x-intercept: (2, 0), meaning average net earnings are $0 per pack after 2 packs. Horizontal asymptote: y=4, meaning average net earnings per pack approach $4 as more packs are sold.** Set 4-8/x=0 to get x=2. As x increases, 8/x approaches 0, so y approaches 4.

CHALLENGE

Domain: x≠-1 and x≠1. Range: y≠-1/2 and y≠0. Hole: (-1, -1/2). Vertical asymptote: x=1. Horizontal asymptote: y=0.

Accept equivalent set notation for domains and ranges. In the challenge, the printed graph shows the simplified rule; g has a hole at the point where x=-1.