Quick Review

Use factoring to find the real zeros of the function.

1. $f(x) = 2x^2 + 7x + 6$ $(x+2)(2x+3)$
2. $f(x) = x^2 - 16$ $(x+4)(x-4)$
3. $f(x) = x^2 + 16$ irreducible quadratic
4. $f(x) = x^3 - 27$ $(x-3)(x^2+3x+9)$

Find the quotient and remainder when $f(x)$ is divided by $d(x)$.

5. $f(x) = 5x - 3, \quad d(x) = x$

$p = 6$ $\quad q = 2 \quad p/q$

$\pm 1, \pm 2, \pm 3, \pm 6 \quad \pm 1, \pm 2 \quad \pm 1/2, \pm 3/2$

$$\begin{array}{r|rrrr} 3 & 1 & 0 & 0 & -27 \\ + & \downarrow & 3 & 9 & 27 \\ \hline & 1 & 3 & 9 & 0 \end{array}$$

Functions — 12 Basic Functions

Polynomials

Factoring
Dividing

Rational Functions

$$\frac{f(x)}{g(x)}$$

Quick Review Solutions

Use factoring to find the real zeros of the function.

1. $f(x) = 2x^2 + 7x + 6$ $\quad x = -3/2,\ x = -2$
2. $f(x) = x^2 - 16$ $\quad x = \pm 4$
3. $f(x) = x^2 + 16$ $\quad$ no real zeros
4. $f(x) = x^3 - 27$ $\quad x = 3$

Find the quotient and remainder when $f(x)$ is divided by $d(x)$.

5. $f(x) = 5x - 3,\ \ d(x) = x$ $\quad 5; -3$

Today's Objectives

Label and Construct the graph of a rational function by analyzing identifying characteristics: horizontal asymptotes, vertical asymptotes, x-intercepts, y-intercepts, and removable discontinuities using guided notes and practice problems.

Success Criteria:

- Define rational function
- Determine the domain of a rational function
- Use horizontal asymptotes, vertical asymptotes, x-intercepts, y-intercepts, and removable discontinuities to graph.

Vocabulary: vertical asymptote, horizontal asymptote, x-intercepts, y-intercept, domain, range, end behavior, limit, approaches, infinity

Rational Functions

Let f and g be polynomial functions with $g(x) \neq 0$. Then the function given by $r(x) = \frac{f(x)}{g(x)}$ is a **rational function**.

Why does this definition require that $g(x) \neq 0$?

Ex. Finding the Domain of a Rational Function

Find the domain of f and use limits to describe the behavior at value(s) of x not in its domain.

$$f(x) = \frac{2}{(x+2)}$$

LO: The domain of f is $(-\infty, -2) \cup (-2, \infty)$. I know this is, because 2 divided by 0 is undefined.

Example **Finding the Domain of a Rational Function**

Find the domain of f and use limits to describe the behavior at value(s) of x not in its domain.

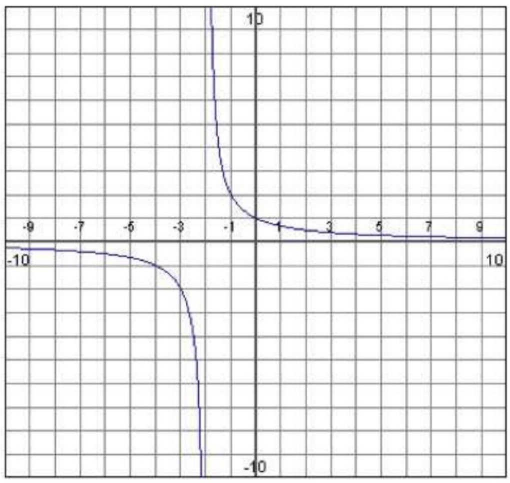
$$f(x) = \frac{2}{x+2}$$

The domain of f is all real numbers $x \neq -2$.
Use a graph of the function to find

$\lim_{x \to -2^+} f(x) = \infty$ and $\lim_{x \to -2^-} f(x) = -\infty$.

$$\lim_{x \to -2^+} f(x) = \infty$$

$$\lim_{x \to -2^-} f(x) = -\infty$$



AM: Graph Rational Functions

y-intercept
(0, __)

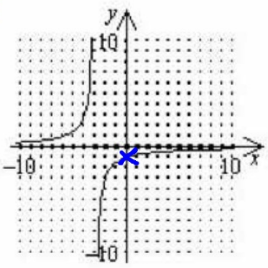
1. Which is the graph of the equation?

$$y = -\frac{3}{x+3}$$

$x + 3 \neq 0$
$-3 \quad -3$
$x \neq -3$

$$\frac{-3}{0+3} = \frac{-3}{3} = -1$$

[A]



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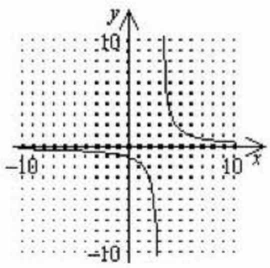

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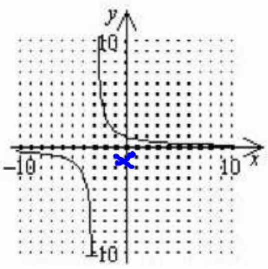

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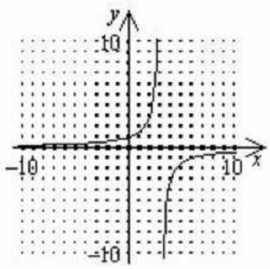
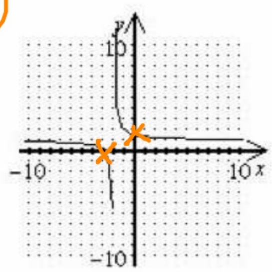


1

AM: Graph Rational Functions and Equations

1. Graph: $f(x) = \dfrac{x+3}{x+2} = \dfrac{-3+3}{-3+2} = 0$ $\qquad \dfrac{0+3}{0+2} = \dfrac{3}{2}$

[A]



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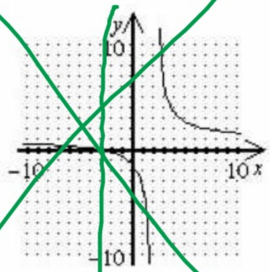

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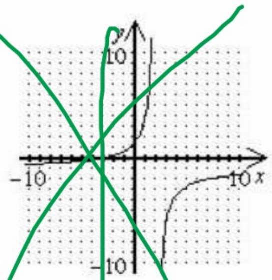

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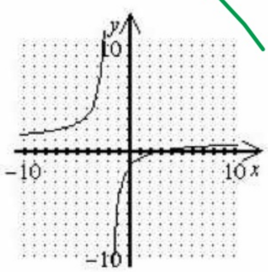

2