AP Precalc

Write your questions and thoughts here!

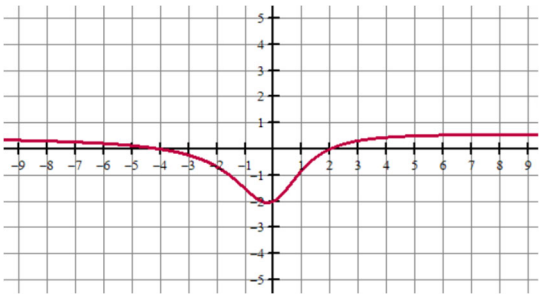
1.8 Rational Functions & Zeros

1.8 Notes

Zeros

Example 1:

$$f(x) = \frac{x^2 + 2x - 8}{2x^2 + 4}$$



Domain:

Zero(s):

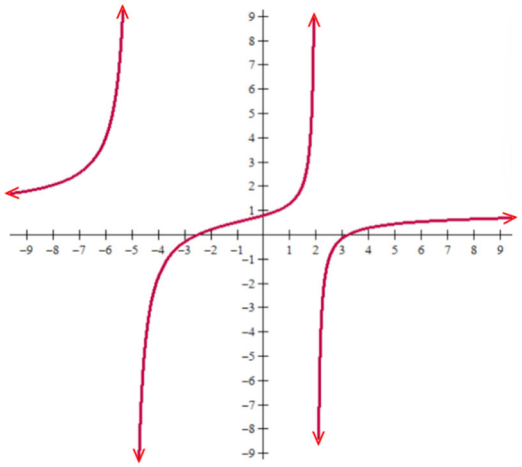
Zeros

Let f be the rational function $f(x) = \frac{N(x)}{D(x)}$ where N and D have no common factors. The zeros of the rational function occur when $N(x) = 0$ for all x in the domain of f.

Vertical Asymptotes

Example 2:

$$f(x) = \frac{x^2 - 0.7x - 8}{x^2 + 3x - 10}$$



Domain:

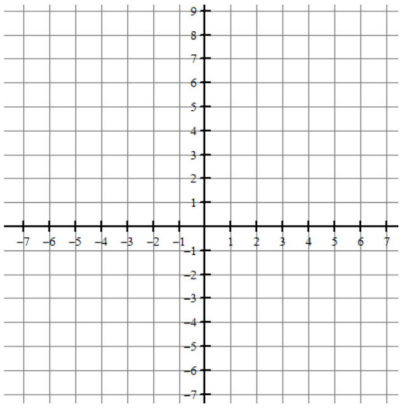
Zero(s):

Vertical Asymptote(s):

Holes

Example 3:

$$g(x) = \frac{x^2 - x - 12}{x - 4}$$



Domain:

Zeros(s):

Hole(s):

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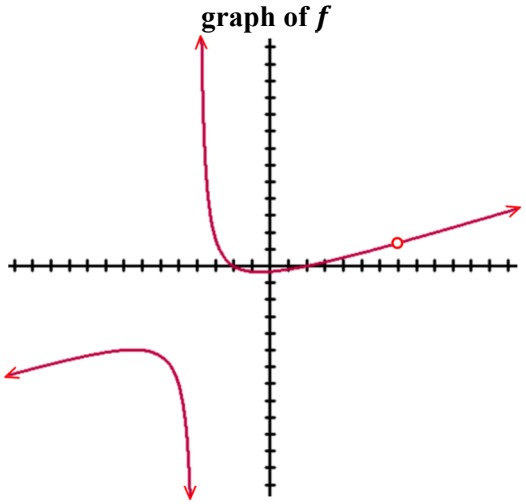
Inequalities

Example 4:



Domain:

Zero(s):

Hole(s):

Vertical Asymptote(s):

y-intercept (estimate):

Where is $f(x) < 0$?

x	$-\infty < x < -4$	-4	$-4 < x < -2$	-2	$-2 < x < 2$	2	$2 < x < 7$	7	$7 < x < \infty$
$f(x)$									

Example 5:

$$f(x) = \frac{x^2 - 4}{x^2 - 2x - 3}$$

Where is $h(x) > 0$?

Domain:

Zero(s):

Vertical Asymptote(s):

y-intercept:

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1.8 Rational Functions and Zeros

AP Precalculus

1.8 Practice

Find the zeros of the following rational function if one exists.

1. $f(x) = \frac{x-1}{x^2-9}$

2. $d(t) = \frac{(t+3)(t-1)}{4t+12}$

3. $h(x) = \frac{x^2-3x-10}{x^2+6x}$

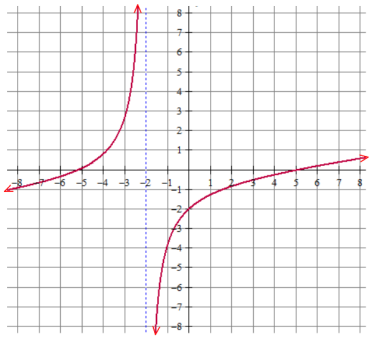
4. $r(x) = \frac{x-1}{x}$

5.

x	$-\infty < x < -3$	-3	$-3 < x < 5$	5	$5 < x < \infty$
$f(x)$	Positive	DNE	Negative	0	Positive

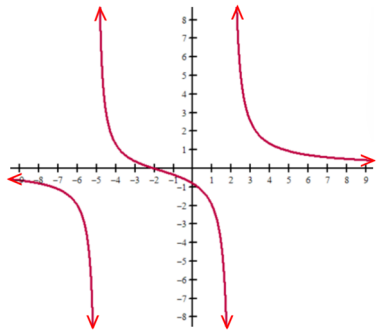
Use the graph to create a sign table.

6.



x	$-\infty < x < -5$	-5	$-5 < x < -2$	-2	$-2 < x < 5$	5	$5 < x < \infty$
$f(x)$							

7.



x	$-\infty < x < -5$	-5	$-5 < x < -2$	-2	$-2 < x < 2$	2	$2 < x < \infty$
$h(x)$							

CALCULATOR ACTIVE - Find the zeros of the following rational function if one exists.

8. $f(x) = \frac{x^2+5x-2}{x^2-9}$

9. $d(t) = \frac{t^2+5t-9}{4t+12}$

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Use the rational function to answer the following. NO CALCULATOR

10.

$$f(x) = \frac{x^2 - 2x - 24}{x - 6}$$

a. Domain:

b. Zero(s):

c. Horizontal Asymptote:

d. *y*-intercept:

e. Where is $f(x) > 0$?

11.

$$g(x) = \frac{4(x + 5)(x - 2)}{x^2 - 4}$$

a. Domain:

b. Zero(s):

c. Horizontal Asymptote:

d. *y*-intercept:

e. Where is $f(x) < 0$?

Use the rational function to answer the following.

12.

$$f(x) = \frac{x + 3}{3x^2 + 6x}$$

a. Domain:

b. Zero(s):

c. Horizontal Asymptote:

d. *y*-intercept:

e. Where is $f(x) < 0$?

13.

$$h(t) = \frac{t^3 - 2t^2}{t^2 + 3t - 18}$$

a. Domain:

b. Zero(s):

c. Horizontal Asymptote:

d. *y*-intercept:

e. Where is $f(x) > 0$?

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Multiple Choice

14. The function f is given by $f(x) = \frac{x^2+2x-24}{4-x}$. Which of the following describes the function f ?

(A) The graph of f has an x-intercept at $x = -6$ and a vertical asymptote of $x = 4$.

(B) The graph of f has an x-intercept at $x = -6$ and a hole at $x = 4$.

(C) The graph of f has an x-intercept at $x = -6$ and a vertical asymptote of $x = -4$.

(D) The graph of f has an x-intercept at $x = -6$ and a hole at $x = -4$.

(E) The graph of f has x-intercepts at $x = -6$ and $x = 4$.

For questions 15 and 16 use the following table.

x	$-\infty < x < -3$	-3	$-3 < x < 0$	0	$0 < x < 2$	2	$2 < x < \infty$
$f(x)$	positive	0	negative	undefined	negative	0	positive

15. Which of the following must be true for the function f ?

(A) The graph of f has a maximum at $x = -3$ and a minimum at $x = 2$.

(B) The graph of f has a minimum at $x = -3$ and a maximum at $x = 2$.

(C) f has exactly two distinct real zeros.

(D) f has exactly three distinct real zeros.

(E) The graph of f has a vertical asymptote at $x = 0$.

16. Which of the following could be an expression for $f(x)$?

(A) $\frac{x(x+3)(x-2)}{x}$

(B) $\frac{x(x-3)(x+2)}{x}$

(C) $\frac{x}{x(x+3)(x-2)}$

(D) $\frac{x}{x(x-3)(x+2)}$

(E) None of the above

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17. The function r is given by $r(x) = \frac{x^2-4}{x+3}$. On what intervals of x is $r(x) \geq 0$?

(A) $x \geq 2$ only

(B) $-2 \leq x \leq 2$ only

(C) $-3 < x \leq -2$ and $x \geq 2$

(D) $x < -3$ only

18. The function r is given by $r(x) = \frac{x^2-4x}{x^2+8x+16}$. On what intervals of x is $r(x) < 0$?

(A) $x > 4$

(B) $0 < x < 4$

(C) $-4 < x < 4$

(D) $x < -4$

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