

**2.7 Rational Functions**

Target 2F: Graph, Solve and Analyze Rational Functions

*Review of Prior Concepts*

Using your graphing calculator, find the domain and describe the end behavior:

a)  $f(x) = \frac{1}{x-5}$

b)  $g(x) = \frac{3x-5}{x-2}$

**More Practice****Domain & End Behavior**<http://www.coolmath.com/algebra/15-functions/06-finding-the-domain-01><https://www.khanacademy.org/math/algebra/algebra-functions/domain-and-range/v/domain-of-a-function-intro>[https://youtu.be/Krjd\\_vU4Uvg](https://youtu.be/Krjd_vU4Uvg)<https://youtu.be/PQ85Y1jsVzQ>**SAT Connection****Passport to Advanced Math****10. Interpret parts of nonlinear expressions in terms of their context**

Example:

$$h(x) = \frac{1}{(x-5)^2 + 4(x-5) + 4}$$

For what value of  $x$  is the function  $h$  above undefined?

/				
.	○	○	○	○
0	○	○	○	○
1	○	○	○	○
2	○	○	○	○
3	○	○	○	○
4	○	○	○	○
5	○	○	○	○
6	○	○	○	○
7	○	○	○	○
8	○	○	○	○
9	○	○	○	○

**NOTE:** You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.

Solution

## Analyzing Graphs of Rational Functions



Vocabulary Term	In my own words...	Example(s)
Rational Function		

Describe the behavior of the graphs of the rational functions at the  $x$ -values not in the domain.

a)  $f(x) = \frac{1}{x-5}$

b)  $g(x) = \frac{3x-5}{x-2}$

c)  $h(x) = \frac{-5}{x+4}$

## Vertical and Horizontal Asymptotes

Recall:

Vertical asymptotes occur when \_\_\_\_\_

Horizontal asymptotes are found from \_\_\_\_\_

Using your graphing calculator, find the vertical and horizontal asymptotes.

a)  $f(x) = \frac{3x-5}{x-4}$

b)  $g(x) = \frac{3x^2-5}{x^2-4}$



Without using your graphing calculator, find the vertical and horizontal asymptotes algebraically.

a)  $f(x) = \frac{3x-5}{x-4}$

b)  $g(x) = \frac{3x^2-5}{x^2-4}$

Using your graphing calculator, find the horizontal asymptotes (if any).

a)  $f(x) = \frac{3x^2 - 5x + 1}{x^2 - 4}$

b)  $g(x) = \frac{3x - 5}{x^2 - 4}$

c)  $h(x) = \frac{3x^2 - 5x + 1}{x - 4}$

Can you find a pattern? If yes, then find the horizontal asymptotes (if any) without using your graphing calculator.

a)  $f(x) = \frac{2x^3 + x^2 - 5x + 1}{x^3 - 4}$

b)  $g(x) = \frac{2x - 5}{x^3 - 4}$

c)  $h(x) = \frac{2x^3 + x^2 - 5x + 1}{x - 4}$

### Conclusion about Horizontal Asymptotes:

①

②

③

### More Practice

#### Vertical Asymptotes

<http://www.sosmath.com/calculus/limcon/limcon04/limcon04.html>

<https://www.khanacademy.org/math/algebra2/rational-expressions-equations-and-functions/discontinuities-of-rational-functions/v/analyzing-vertical-asymptotes-of-rational-functions>

<https://www.youtube.com/watch?v=cIkIKyRsybY>

<https://www.youtube.com/watch?v=ALFNI6QHbVU>

#### Horizontal Asymptotes

<http://www.coolmath.com/precalculus-review-calculus-intro/precalculus-algebra/18-rational-functions-finding-horizontal-slant-asymptotes-01>

[http://www.softschools.com/math/calculus/finding\\_horizontal\\_asymptotes\\_of\\_rational\\_functions/](http://www.softschools.com/math/calculus/finding_horizontal_asymptotes_of_rational_functions/)

<https://www.youtube.com/watch?v=E0iNtii45KA>

Homework Assignment

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**SAT Connection****Solution**

The correct answer is 3. The function  $h(x)$  is undefined when the denominator of  $\frac{1}{(x - 5)^2 + 4(x - 5) + 4}$  is equal to zero. The expression  $(x - 5)^2 + 4(x - 5) + 4$  is a perfect square:  $(x - 5)^2 + 4(x - 5) + 4 = ((x - 5) + 2)^2$ , which can be rewritten as  $(x - 3)^2$ . The expression  $(x - 3)^2$  is equal to zero if and only if  $x = 3$ . Therefore, the value of  $x$  for which  $h(x)$  is undefined is 3.