Notes 5.2 An Introduction to Rational Functions

Identifying Restricted Values, Domain, X–Intercept(s) and Y–Intercept

Consider the rational function $f(x) = \frac{2x^2-5x-3}{x^2-x-6}$ to find the indicated function values below.

y-int $= \frac{-3}{-6} = \frac{1}{2}$

a. Now, rewrite the function *f*(*x*) in completely factored form:

$2x^2-5x-3$
$2x^2-6x+x-3$
$2x(x-3)+(x-3)$
$(x-3)(2x+1)$

$f(x) = \frac{\cancel{(x-3)}(2x+1)}{\cancel{(x-3)}(x+2)}$ Zero @ $x = -\frac{1}{2}$

Hole @ $x=3$ VA @ $x=-2$

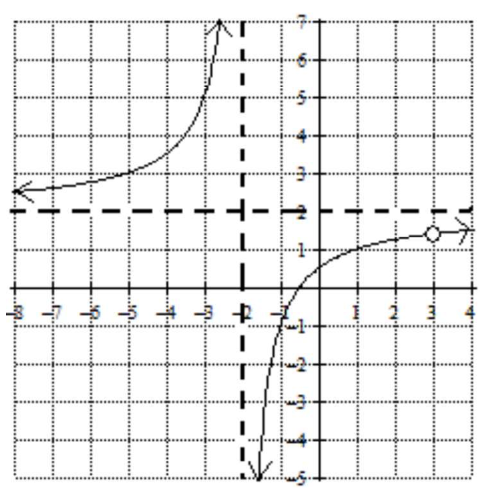
b. What do you notice when you evaluate $f(-2)$ and $f(3)$ in the factored equation?

when the factors of the denominator are set to 0 and solved, the results are $x = -2$ and $x = 3$ which are the same x-values that caused f(x) to be undefined.

Definition of a Restricted Value:

A value of x in which there is no y-value. In a rational function, these values are values that make any factor of the denominator = 0.

c. The graph of $f(x) = \frac{2x^2-5x-3}{x^2-x-6}$ is pictured to the right. Describe the graph of *f*(*x*) at its two restricted values.



At $x=-2$ and $x=3$, the graph of f(x) is discontinuous.

d. What is the domain of the function graphed?

$(-\infty, -2) \cup (-2, 3) \cup (3, \infty)$

From the equation of the rational function, how do you determine the restricted value(s)?	Set factors of denominator =0 and solve
From the equation of the rational function, how do you determine the domain?	The domain is $(-\infty, \infty)$ with the restricted values excluded
From the equation of the rational function, how do you determine the zero(s) of the graph?	Set the noncanceling factor(s) of the numerator =0 and solve.
From the equation of the rational function, how do you determine the $y-$intercept of the graph?	The y-int is the ratio of the constant terms of the numerator and denominator.

Given each rational function below, identify the indicated information.

	$f(x) = \dfrac{3x^2 - 7x - 6}{x^2 - 2x - 3}$	$g(x) = \dfrac{x^2 + 3x - 10}{x^2 - 4}$
Rewrite the function in factored form.	Zero @ $x = -2/3$ $f(x) = \dfrac{(3x+2)\cancel{(x-3)}}{\cancel{(x-3)}(x+1)}$ VA @ $x=-1$ Hole @ $x=3$	Zero @ $x=-5$ $g(x) = \dfrac{(x+5)\cancel{(x-2)}}{(x+2)\cancel{(x-2)}}$ VA @ $x=-2$ Hole @ $x=2$
Identify the restricted values of the function and the domain.	$x \neq -1$ and $x \neq 3$ Domain: $(-\infty,-1)\cup(-1,3)\cup(3,\infty)$	$x \neq -2$ and $x \neq 2$ Domain: $(-\infty,-2)\cup(-2,2)\cup(2,\infty)$
What is/are the zero(s) of the function?	$3x+2=0$ $3x=-2$ Zero at $x = -2/3$	$x+5=0$ Zero at $x=-5$
What is the $y-$intercept of the graph of the function?	$y\text{-int} = \frac{-6}{-3} = 2$ $(0,2)$	$y\text{-int} = \frac{-10}{-4} = 5/2$ $(0, 5/2)$