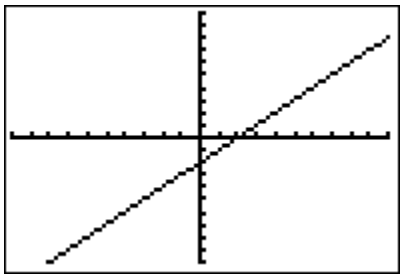
PreCalculus 12 Date _____

Unit 9: Rational Functions

9.2 Analysing Rational Functions

Graph the function $f(x) = \frac{x^2-5x+6}{x-3}$ with your graphing calculator & sketch the result. Is the graph what you expected? Explain.



Why no asymptote?
What about the non-permissible $x \neq 3$.?

Simplify $f(x) = \frac{x^2-5x+6}{x-3}$ and use the simplified form to graph $f(x)$ by hand:

calc can't show these "holes"

$= (x-2)\cancel{(x-3)}$

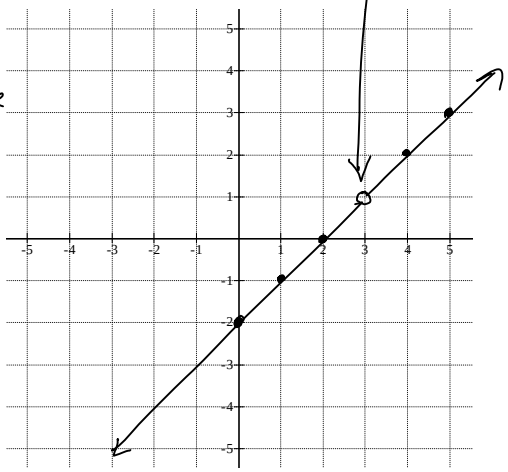
$\cancel{x-3}$

$g(x) = x-2$

$f(3) =$ undefined

$g(3) = 1$

$f(x) + g(x)$ are not the same but they agree at all but one point $(3,1)$



A vertical asymptote of the graph of a corresponds to a non-permissible value in the equation of the function, but not all non-permissible values result in vertical asymptotes. Sometimes a non-permissible value instead results in a **point of discontinuity** in the graph.

Point of Discontinuity:

- a point at which the graph of a function is not continuous, a "hole" in the graph represented by an open circle
- occurs at non-permissible value(s) whose causing denominator factor can be cancelled with the numerator

Ex. Compare the functions $f(x) = \frac{x^2-2x}{4-2x}$ and $g(x) = \frac{x^2+2x}{4-2x}$. Explain any differences & verify by graphing with your calculator.

• $f(x)$ + $g(x)$ both have NPV $x \neq 2$

$f(x) = \frac{x(x-2)}{2(2-x)}$ $\quad g(x) = \frac{x(x+2)}{2(2-x)}$ simplified

$= \frac{-x}{2}$

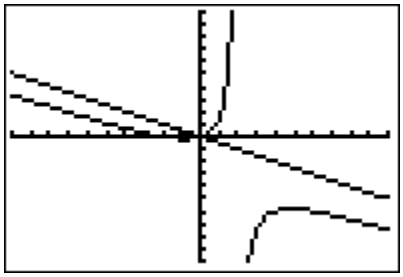
Point of discontinuity at $(2, -1)$

$\frac{-(2)}{2}$

$x=2$ is a vertical asymptote

$f(2) = \frac{0}{0}$ is indeterminate ↓ point of discontinuity

$g(2) = \frac{8}{0}$ is undefined ↓ vertical asymptote



Ex. Match the equation of each rational function with the most appropriate graph. Give reasons for each choice.

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

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

vertical asymptote $x=2$

point of discontinuity at $(-2, \frac{1}{2})$

$\therefore A(x)$ Graph 2

$B(x) = \frac{2x+4}{x^2+1}$

$x^2+1 \neq 0$

There are no NPVs

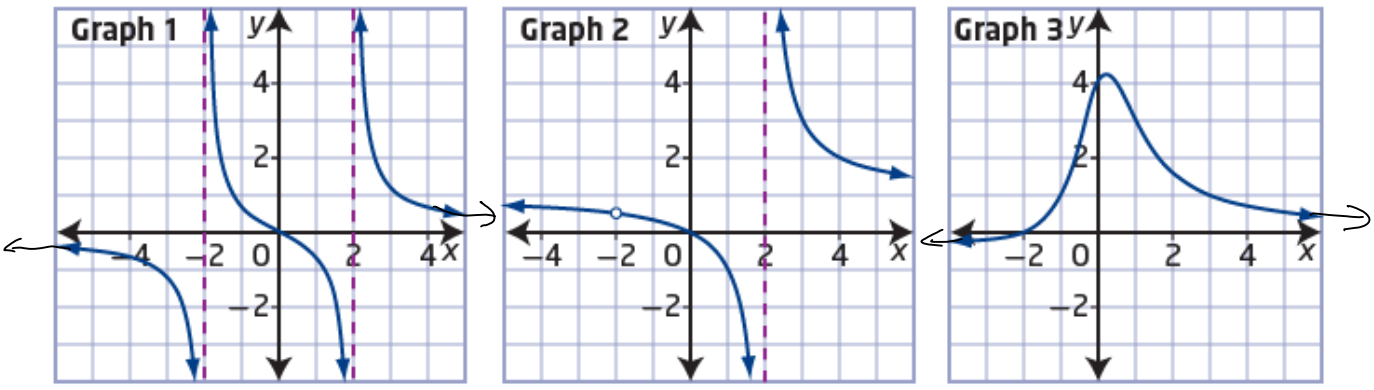
$\therefore$ Graph 3

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

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

vertical asymptotes at $x=2$ and $x=-2$

$\therefore$ Graph 1



Practice: pg. 451/ # 1, 3 – 8, 10, 18, 21