Feb. 22, 2017

Sects. 4-1 ! 2

Rational Functions

Defn.

Basic Shape

Vertical Asymptote / Hole (Domain)

Horiz. Asym

Oblique Asym

Defn.

$$R(x) = \frac{N(x)}{D(x)}$$

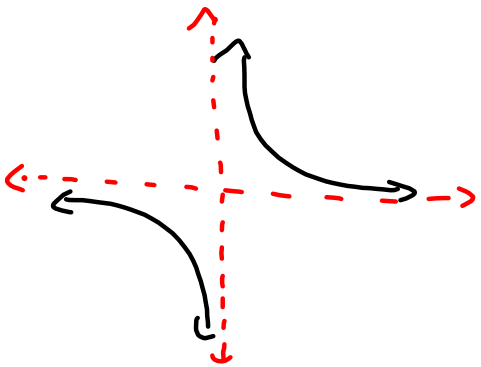
Must have a variable in the denominator.

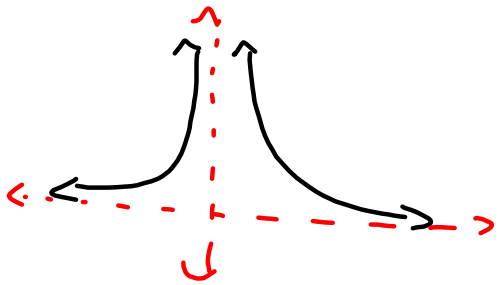
Eg: $f(x) = \frac{1}{x}$

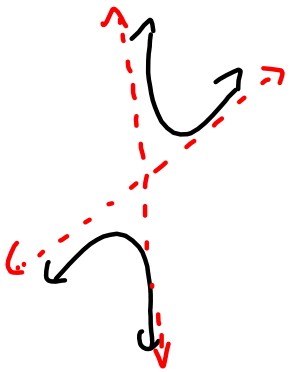
$$g(x) = \frac{x+2}{2x-5}$$

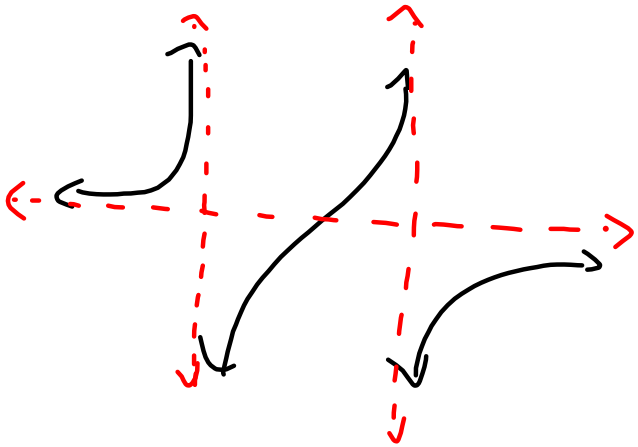
$$h(x) = \frac{3x^2+2x-5}{x+6}$$

Basic Graph Shape









Vert. Asym / Hole

Where? When denom = 0

And numer ≠ 0

Find eq. of V.A. of $f(x) = \frac{1}{x}$

$x = 0$

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

V.A: $x = 3$

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

V.A. : $x^2 - 3x + 2 = 0$

$(x-2)(x-1) = 0$

$x = 2$ or $x = 1$

$2-1=1 \neq 0$ Vert. Asym

$1-1=0$ Hole

V.A. : $x = 2$

Hole @ $x = 1$

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

Find the domain of $f(x)$.

V.A: $x = 2$ Hole @ $x = 1$

Domain $\{x \mid x \neq 1, 2\}$

$(-\infty, 1) \cup (1, 2) \cup (2, \infty)$

Vocab

Degree: $2x^3$ deg 3

$-5x^2$ deg 2

$4x^2+3x-6$ deg 2

Leading Coefficient: The coeff. of the highest deg. term

$2x^2+3x-5$ l.c. = 2

$4x-5x^2+1$ l.c. = -5

Horiz. Asym

Not every rat. fnct. has one.

1. If deg. $D >$ deg. N then
   H.A. : $y = 0$ (x-axis)
2. If deg $D =$ deg N then
   H.A. : $y = \frac{l.c.}{l.c.}$
3. If deg $D <$ deg N then
   No H.A.

Find the eqn. of H.A.

$f(x) = \frac{2x+3}{x^2-5}$ H.A.: $y = 0$

$f(x) = \frac{6+5x}{2x-3}$ H.A.: $y = \frac{5}{2}$

$f(x) = \frac{3x^2+2x-5}{x+6}$ None

Oblique Asym.

If the deg N is <u>exactly</u> one more than deg D then obl. asym.

Find it? Do the division

O.A.: y = quotient

$$f(x) = \frac{3x^2 + 2x - 5}{x + 6}$$

$$\begin{array}{r|rr|l} -6 & 3 & 2 & -5 \\ & + \downarrow & -18 & 96 \\ \hline & 3 & -16 & \text{Don't care} \end{array}$$

O.A.: $y = 3x - 16$