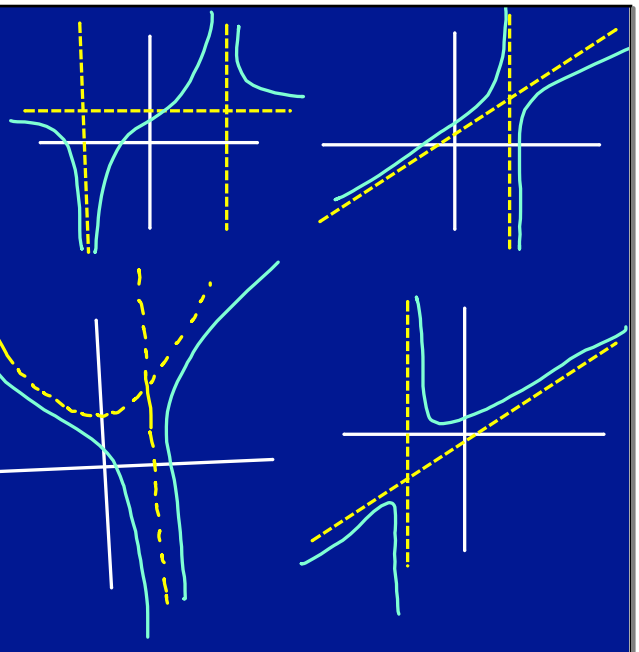
Asymptotes

→ only with rational functions (fractions)

$y = \frac{1}{x}$



Vertical Asymptotes

Denom = 0

Horizontal Asymptotes

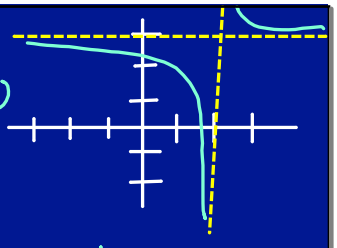
1) Find highest power
2) Take that power from both numerator & denominator

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

$= \frac{1+3x-6}{x-2}$

$y = \frac{3x-5}{x-2}$

$\frac{3x}{x}$ $y = 3$



$y = \frac{3x^2+1}{2x^2-8}$

Vert. $2x^2-8=0$

$2(x^2-4)=0$

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

$x=-2;\ x=2$

Horiz $\frac{3x^2}{2x^2} = 3/2$

$y = 3/2$

$y = \frac{4x-1}{2x^2+5}$

Vert. $2x^2+5=0$

$x^2 = \sqrt{-5/2}$

None

Horiz $\frac{0x^2}{2x^2}=0$

$y=0$

$y = \frac{3x^3-4x+5}{2x^2+7}$

Vert. $2x^2+7=0$

$x=\sqrt{-7/2}$

None

Horiz $\frac{3x^3}{0x^3}$

None

Slant + Nonlinear (Curvilinear) Asymptotes

Method to find: Long Division

Numerator has higher power
No Horiz Asymp / will slant/curvilinear

1) Numerator is 1 power higher

2) Numerator is 2 powers higher

$y = x^2 - 2x + 3$

3) Numerator is 3 or more powers higher

$y = x^3$

$y = x^3 + x^2 + 2x + 1$

Find all asymptotes & graph:

1) Find asymptotes
2) x- & y-intercepts
3) Plot additional points as needed.

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

To Graph:

1) Find asymptotes
2) Find x- & y-int
3) Plot additional pts if needed.

Vertical

$2x - 4 = 0$

$\boxed{x = 2}$

$$2x-4 \;\overline{)\; 4x^2 + 0x - 8} \quad (2x + 4)$$
$$-4x^2 + 8x$$
$$8x - 8$$

Horiz None

Slant $\boxed{y = 2x + 4}$

$y = \dfrac{4x^2 - 8}{2x - 4} \quad (2x-4)$

$0 = \dfrac{4x^2 - 8}{2x - 4} \quad (2x-4)$

$0 = 4x^2 - 8$

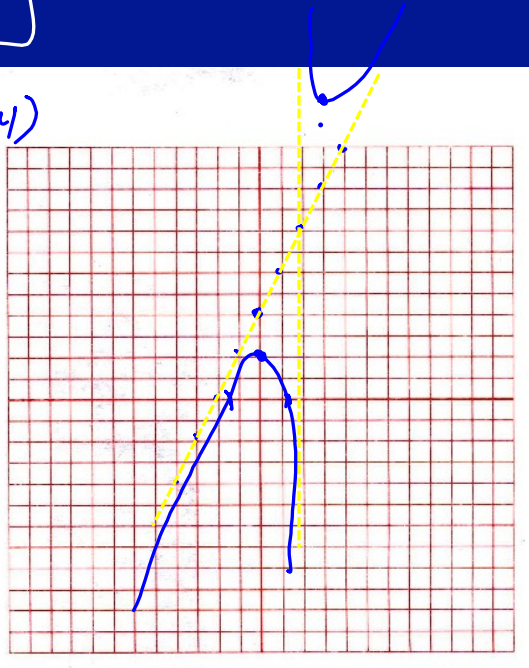
$8 = 4x^2$

$\sqrt{2} = \sqrt{x^2}$

$\pm\sqrt{2} = x$

± 1.4

± 1.4	0 x-int
0	$\frac{-8}{-4} = 2$ y-int
3	$\frac{28}{2} = 14$



$f(x) = \frac{5x+10}{x^2-9}$

-2	0
0	$\frac{-10}{9}$
2	$\frac{20}{-5} = -4$
4	$\frac{30}{7} = 4\frac{2}{7}$
-4	$\frac{-10}{7} = -1\frac{3}{7}$

Vert.

$x^2 - 9 = 0$

$x^2 = 9$

$x = \pm 3$

Horiz

$\frac{0x^2}{x^2} = 0$

$y = .$

$0 = \frac{5x+10}{x^2-9}$

$-10 = 5x$

$-2 = x$