

Vertical Asymptotes

- ① holes - cancel like factors
 (x,y) - set factor = 0 to find x of hole
 - plug X into NEW function to find y of hole
- ② X-int. - numerator = 0 and solve
 (x, 0)
- ③ y-int - plug 0 in for all x's and simplify
 (0, y)
- ④ Vertical Asymptote(s)
 An asymptote is where the graph is undefined.
 To find VA - set denominator equal to zero and solve.

★ holes, x-int., y-int., vertical asymptotes

① $f(x) = \frac{x-2}{4x+12}$

$f(x) = \frac{x-2}{4(x+3)}$ hole none

X-int y-int X-int (2, 0)
 $x-2=0$ $\frac{0-2}{4(0+3)} = -\frac{2}{12} = -\frac{1}{6}$ Y-int (0, -1/6)
 $x=2$ VA $x = -3$

VA $4(x+3) = 0$

lines
 always answer as $x =$ for V.A.

$x+3 = 0$
 $-3 \quad -3$
 $x = -3$

③ $f(x) = \frac{x^2+5x+6}{x^2-2x-8}$ hole (-2, -1/6)

$f(x) = \frac{(x+2)(x+3)}{(x-4)(x+2)}$ NEW X-int (-3, 0)

hole (-2, -1/6) Y-int (0, -3/4) VA $x = 4$

$x+2=0$ X-int $x-4=0$
 $x=-2$ $x+3=0$ $x=4$
 $\frac{x+3}{x-4} = \frac{-2+3}{-2-4} = \frac{1}{-6}$ $\frac{0+3}{0-4} = -\frac{3}{4}$ $x=4$

⑤ $f(x) = \frac{x^2+x-6}{x^2+3x}$

$= \frac{(x+3)(x-2)}{x(x+3)}$ hole (-3, 5/3)

$= \frac{x-2}{x}$ X-int (2, 0)
 $x+3=0$ $x=-3$ y-int NONE
 $x-2=0$ $x=2$
 $\frac{0-2}{0} = \text{und.}$ VA $x = 0$
 $\frac{-3-2}{-3} = \frac{-5}{-3} = \frac{5}{3}$ $x=0$

#7 + 8

hole
 x-int
 y-int
 v.a.

⑦

$$f(x) = \frac{x+4}{2x^2-6x} = \frac{x+4}{2x(x-3)}$$

x-int
 $\frac{x+4}{x+4}=0$
 $x=-4$

VA $2x=0$ $x-3=0$
 $x=0$ $x=3$

No hole
x-int (-4,0)

y-int none

VA $x=0, x=3$

y-int
 $\frac{0+4}{2(0)(0-3)} = \frac{4}{0}$ DNE

⑧ $f(x) = \frac{x^2-2x-8}{x^2-5x+4} = \frac{(x-4)(x+2)}{(x-4)(x-1)} = \frac{(x+2)}{(x-1)}$

hole (+4, 2/5)

$$\left. \begin{array}{l} x-4=0 \\ +4+4 \\ x=+4 \end{array} \right\} \frac{x+2}{x-1} = \frac{-4+2}{-4-1} = \frac{-2}{-5} = \frac{2}{5}$$

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

y-int (0, -2) NEW

$$\frac{x+2}{x-1} = \frac{0+2}{0-1} = \frac{2}{-1} = -2$$

VA $x=1$
 $x-1=0$
 $x=1$

#2