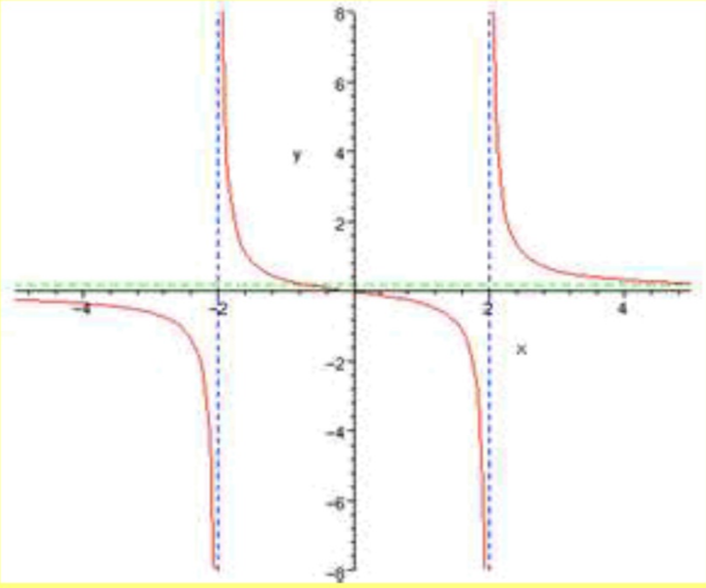
Sec 3.5.2
Finding vertical and horizontal asymptotes

Asymptotes act like boundaries for a graph. On both sides, the graph will approach either negative, or positive, infinity.
Yesterday, we described asymptotic behavior and end behavior.
Today...finding the asymptotes that cause it.



Three types of asymptotes occur:

① Vertical

② Horizonal

③ Slant/oblique

Well work with only vertical & horizontal in one lesson; slant in another.

Finding vertical

Simple! Set denominator equal to zero and solve.

Example-

$f(x) = \dfrac{x}{x^2-9}$

$x^2-9 \neq 0$

$x^2 \neq 9$

$x \neq \pm 3$

VAs @ $x = \pm 3$

$f(x) = \dfrac{\cancel{x+4}}{x^2-16}$

$\cancel{(x+4)}(x-4)$

$\uparrow$

VA @ $x = 4$

hole @ $x = -4$

$f(x) = \dfrac{x+4}{x^2+16}$

$x^2+16 \neq 0$

$x^2 \neq -16$

$x \neq \pm\sqrt{16}$

$= \pm 4i$

no VA

Finding horizontal

We will compare the ***degree*** of the numerator vs. denominator, where "*n*" is the degree of the numerator and "*m*" is the degree of the denominator.

- If n < m there is a horizontal asymptote @ y = 0
- If n = m, there is a horizontal asymptote at the ratio of the leading coeffiecients
- If n > m there is ***no*** horizontal asymptote

(this is when slant asymptotes will occur, however)

*suggest for your notecard

n = m	n < m	n > m
horizontal at ratio	horiztonal at y = 0	none
$\dfrac{6-4x^{1}}{5+2x^{1}}$	$\dfrac{4x^{1}+3}{x^{3}-8}$	$\dfrac{6x^{3}+2}{x^{2}}$
HA @ $y = -2$	HA @ $y = 0$	no HA (later: slant)

$\frac{-4}{2} = -2$ $\qquad 1 < 3 \qquad 3 > 2$

Suggested Practice
Sec 3.5 page 406/407
21-44 odds
***find asymptotes only…no graphing today**

21. VA @ $x = -4$

23. VA @ $x = -4$
$x = 0$

25. VA @ $x = -4$
hole @ $x = 0$

27. none

29. hole @ $x = 3$

31. VA @ $x = -3$
hole @ $x = 3$

33. VA @ $x = 3$
hole @ $x = -7$

35. hole @ $x = -7$

37. $y = 0$

39. $y = 4$

41. no HA

43. $y = -2/3$