Asymptotes

Vertical Asymptotes occur where the denominator of the fraction equals zero.
Ex.

$$f(x) = \frac{3}{x^2 - x - 12}$$

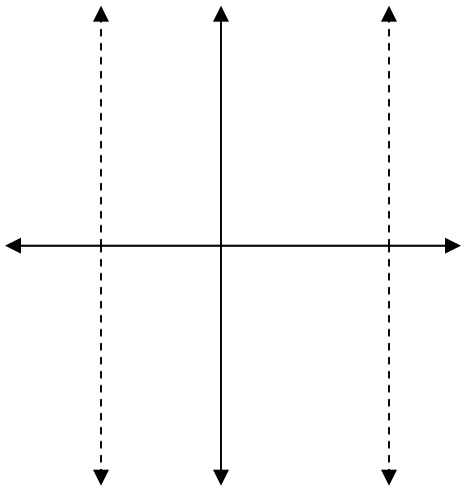
$x^2 - x - 12 = 0$

$(x-4)(x+3) = 0$

$x - 4 = 0$ $\quad$ $x + 3 = 0$

$x = 4$ $\quad$ $x = -3$

Vertical asymptotes: x=4 and x=-3.



Horizontal Asymptotes:

There are 3 rules to follow for Horizontal Asymptotes depending on the exponents in the numerator and denominator:

1. If the highest exponent in the numerator is **less than** the highest exponent in the denominator, then the Horizontal Asymptote is **y = 0**.

Ex. $f(x) = \frac{3x^3 + 9x - 2}{2x^4 - 8x^3 + 4x^2}$ The 3 exponent in the numerator is **less than** the 4 exponent in the denominator.

Horizontal Asymptote: **y = 0**

2. If the highest exponent in the numerator is **equal to** the highest exponent in the denominator, then the Horizontal Asymptote is the **ratio** of the 2 coefficients.

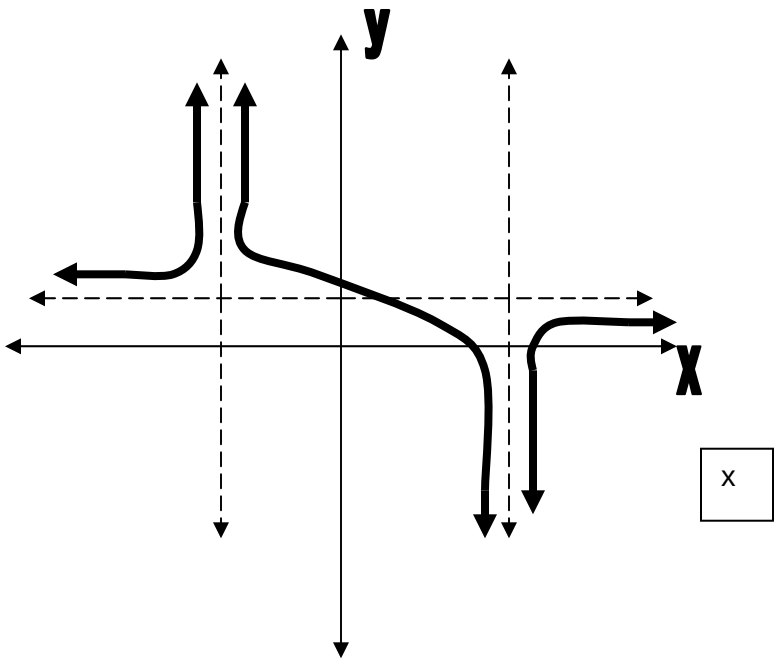
Ex. $f(x) = \frac{3x^4 + 9x - 2}{2x^4 - 8x^3 + 4x^2}$ The 4 exponent in the numerator is **equal to** the 4 exponent in the denominator.

Horizontal Asymptote: $y = 3/2$

3. If the highest exponent in the numerator is **greater than** the highest exponent in the denominator, then there is **no Horizontal Asymptote**.

Ex. $f(x) = \frac{3x^5 + 9x - 2}{2x^4 - 8x^3 + 4x^2}$ The 5 exponent in the numerator is **greater than** the 4 exponent in the denominator.

Horizontal Asymptote: **None**


y
x
x