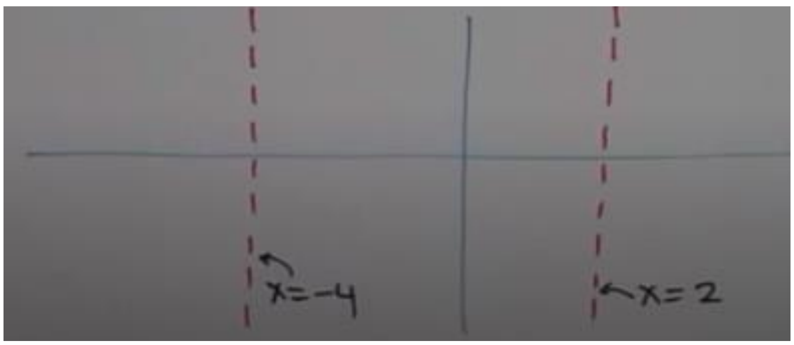
$$f(x) = \frac{x^2}{x^2 + 2x - 8} = \frac{x^2}{(x-2)(x+4)}$$

Vertical Asymptotes

The non-permissible values of the function are x = 2 and x = -4.

Since the binomials (x - 2) and (x + 4) do not cancel, there are infinite discontinuities at x = 2 and x = 4.

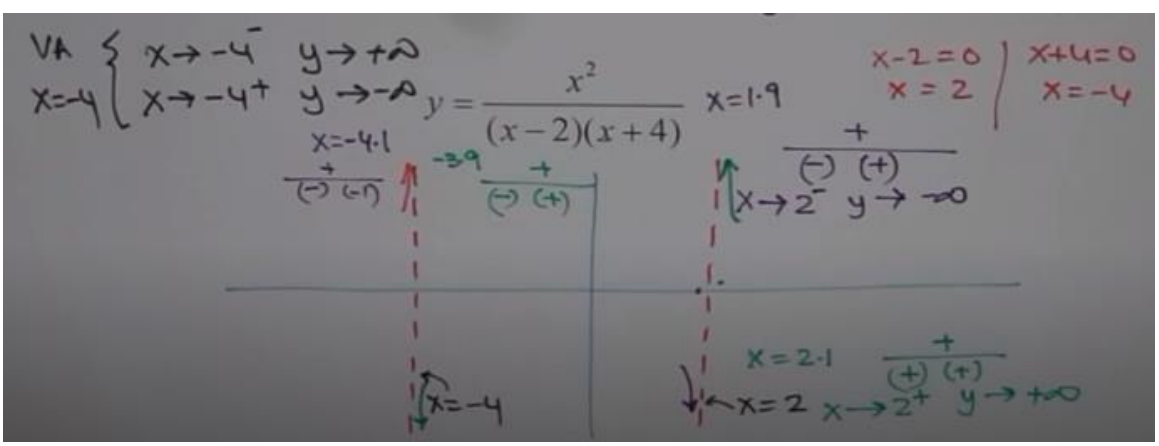
Therefore, we can say the equations of the vertical asymptotes are x =2 and x = -4.



Expressing Vertical Asymptotes using Limit Notation

$\lim_{x \to -4^-} f(x) = +\infty \qquad x = -4 \qquad\qquad \lim_{x \to 2^-} f(x) = -\infty \qquad x = 2$

$\lim_{x \to -4^+} f(x) = -\infty \qquad x = -4 \qquad\qquad \lim_{x \to 2^+} f(x) = +\infty \qquad x = 2$



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

<u>Horizontal Asymptotes</u>

Shortcut: Compare the largest exponents in the numerator and denominator.

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

<u>Expressing Horizontal Asymptotes using Limit Notation</u>

Left End Behavior

$$\lim_{x\to -\infty} \frac{x^2}{x^2+2x-8} = 1$$

Right End Behavior

$$\lim_{x\to -\infty} \frac{x^2}{x^2+2x-8} = 1$$