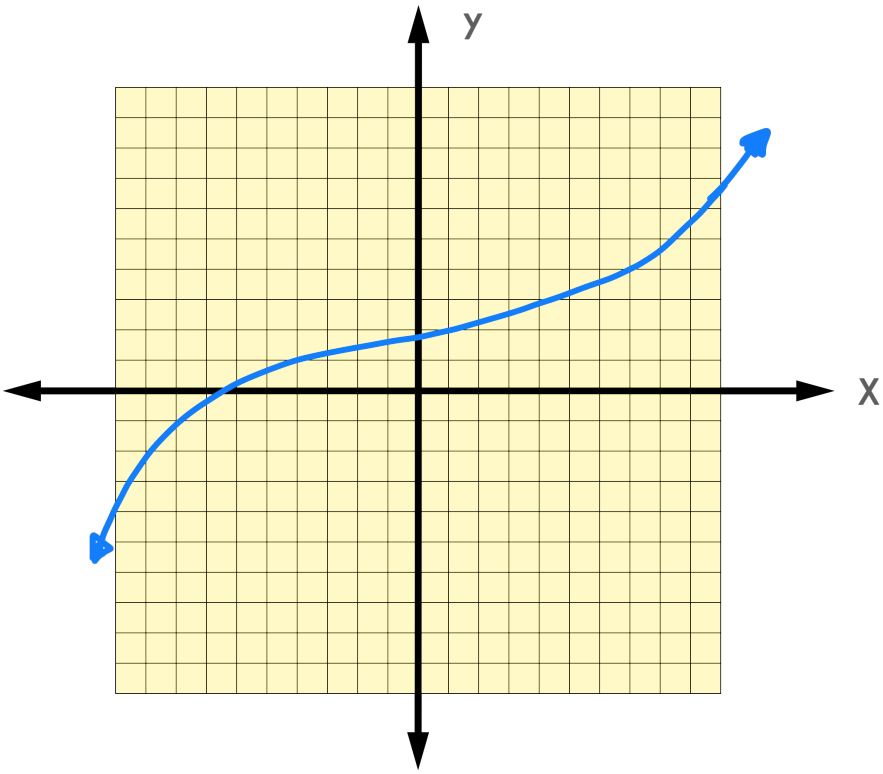
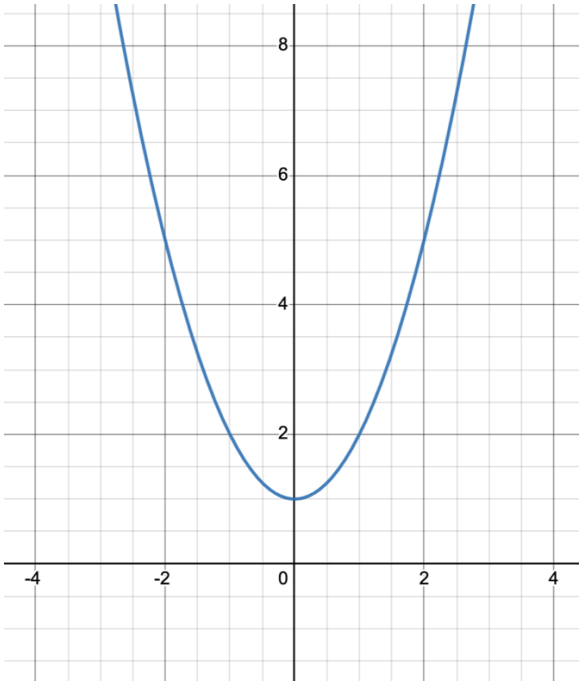
General Limit Notes

Continuous Functions

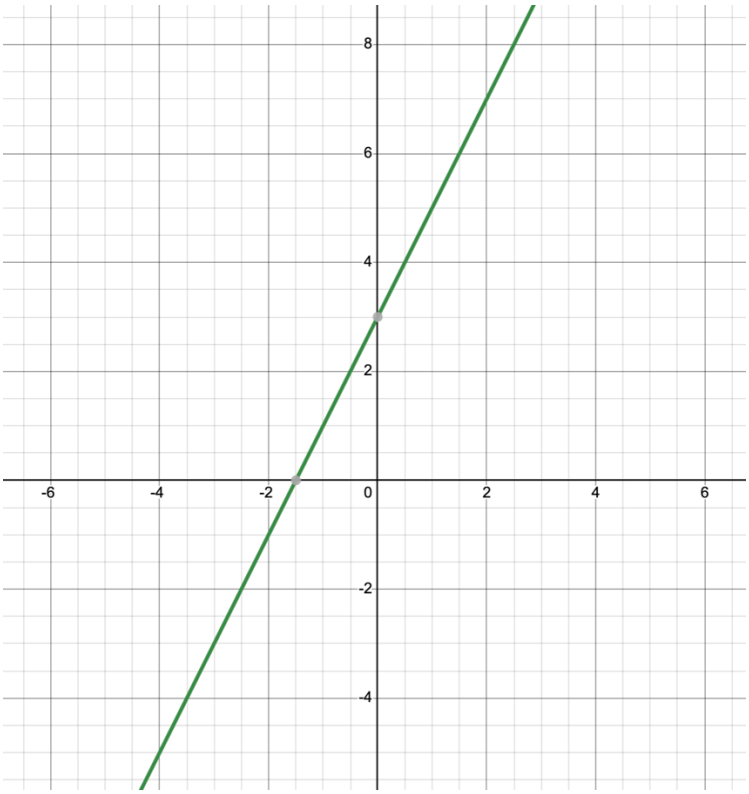


$$\lim_{x \to a} f(x) = f(a)$$

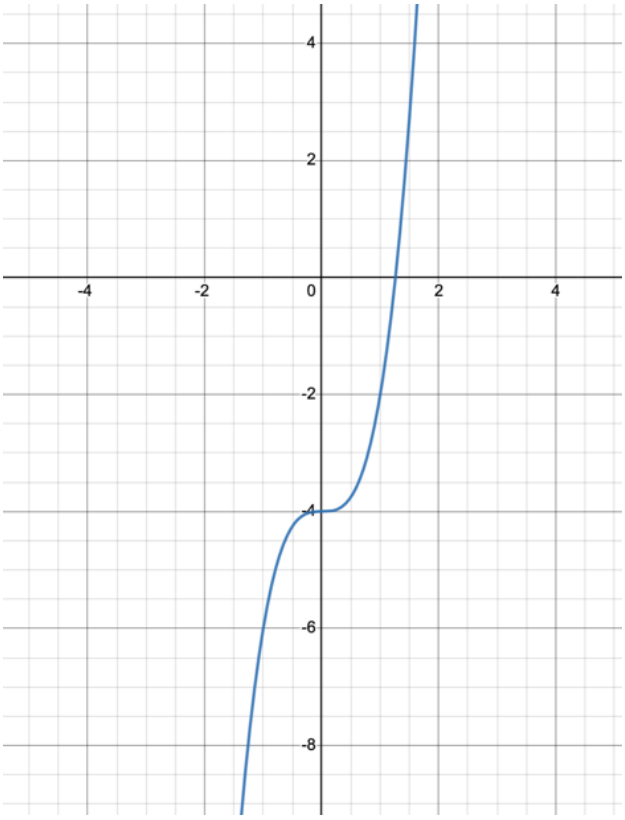
$$f(x) = x^2 + 1$$



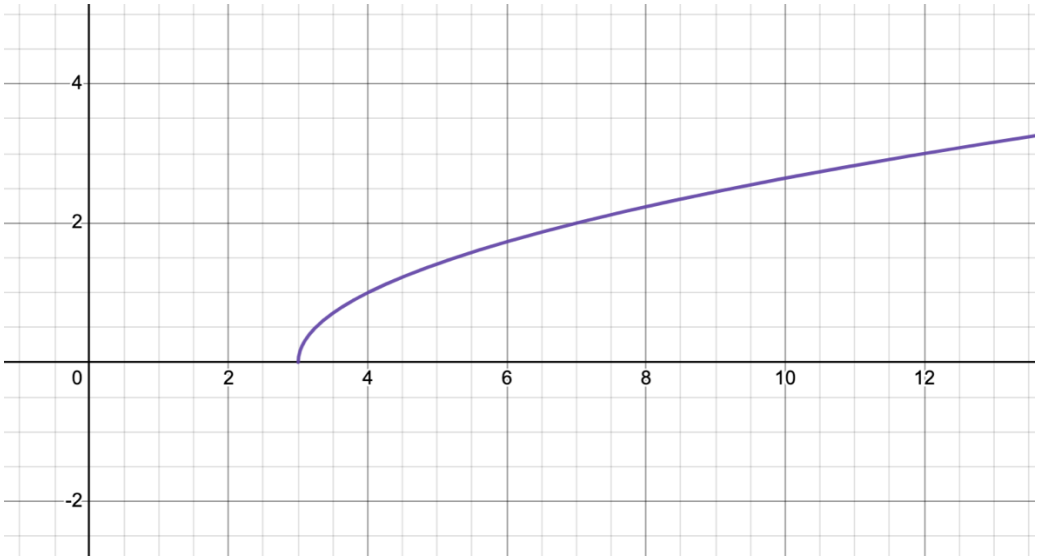
$$f(x) = 2x + 3$$



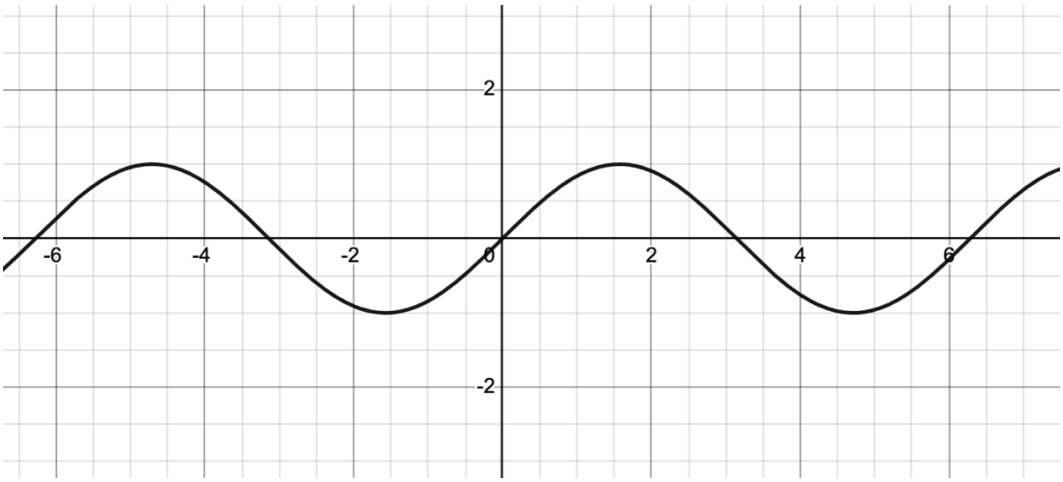
$$f(x) = 2x^3 - 4$$



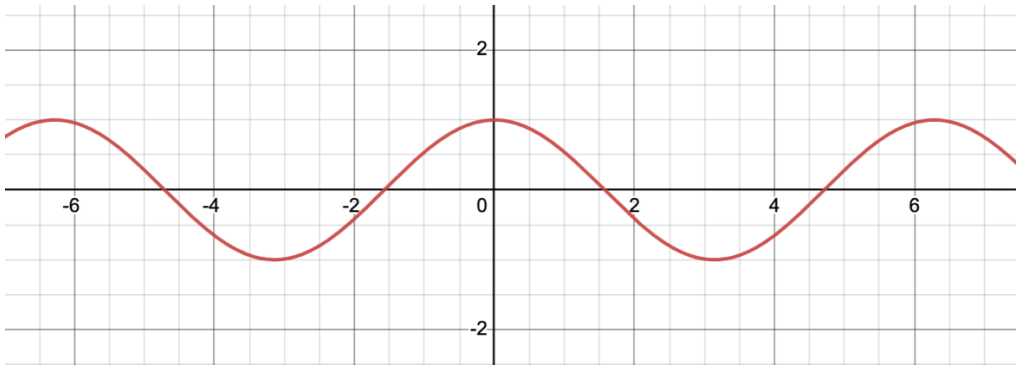
$$f(x) = \sqrt{x - 3}$$



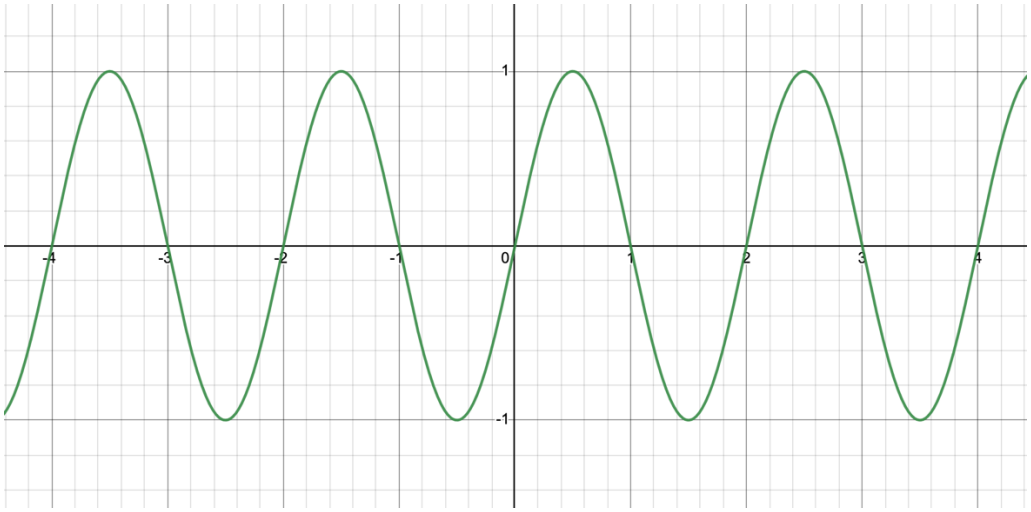
$$f(x) = sin(x)$$



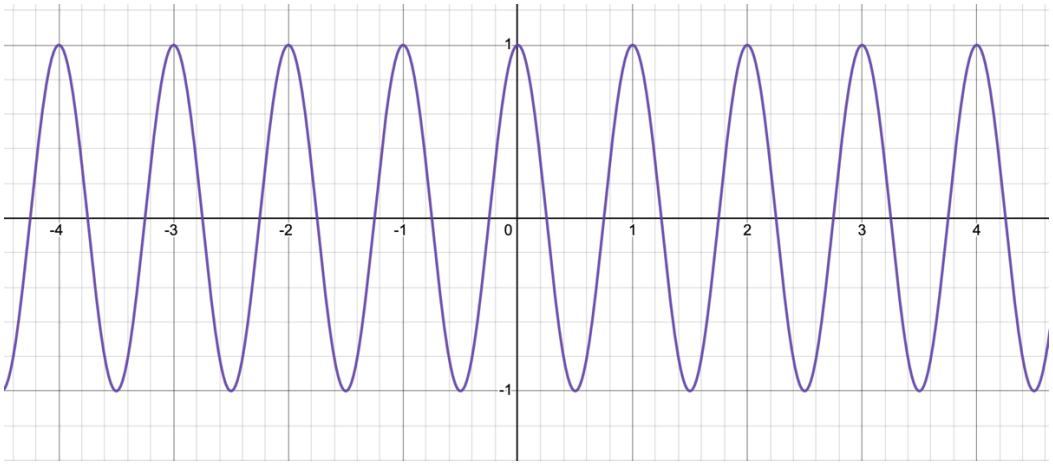
$$\boldsymbol{f(x) = cos(x)}$$



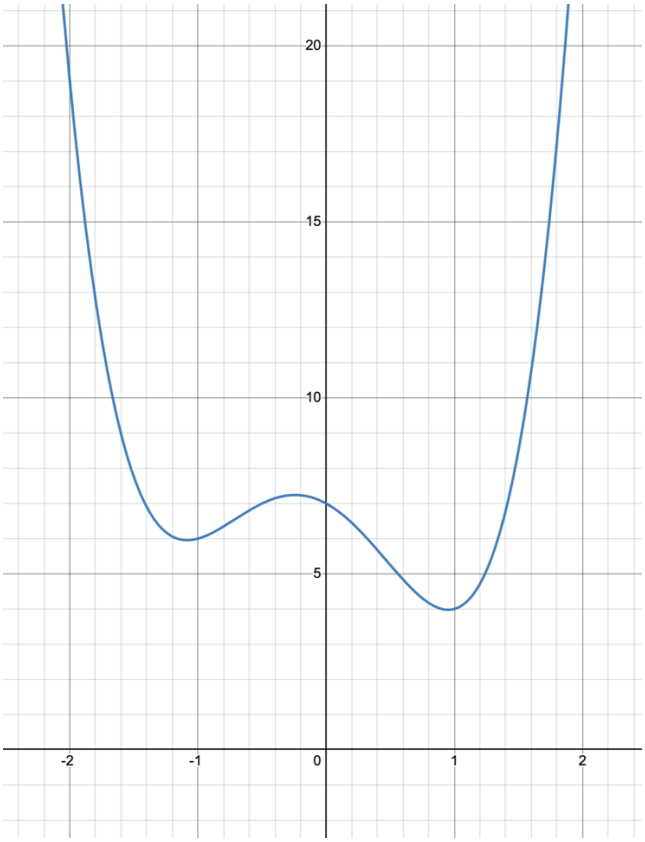
$$f(x) = sin(\pi x)$$



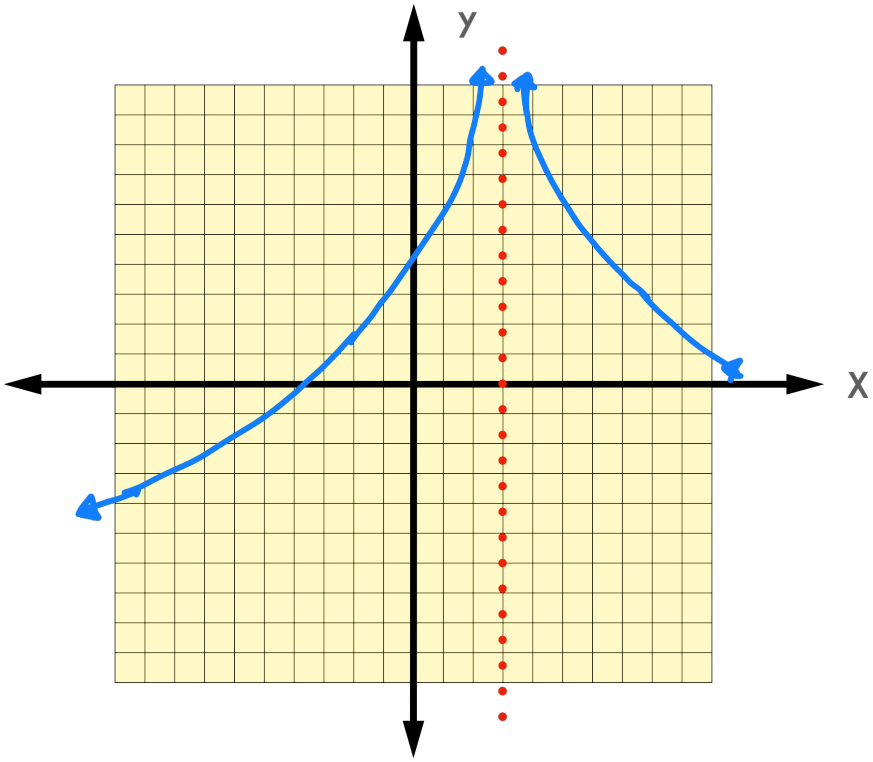
$$f(x) = cos(2\pi x)$$



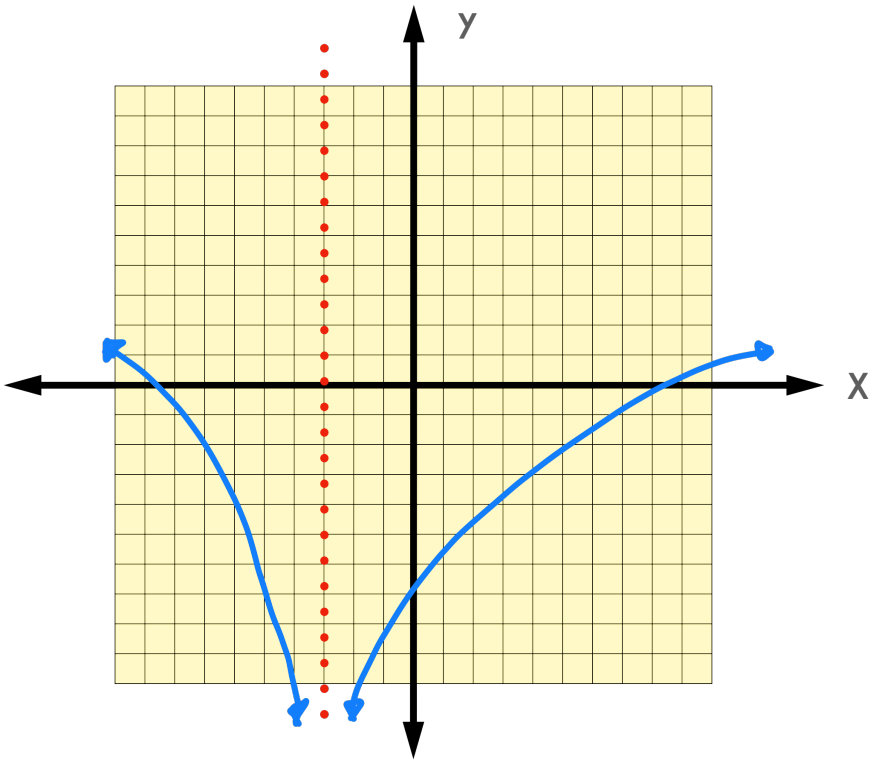
$$f(x) = 2x^4 + x^3 - 4x^2 - 2x + 7$$



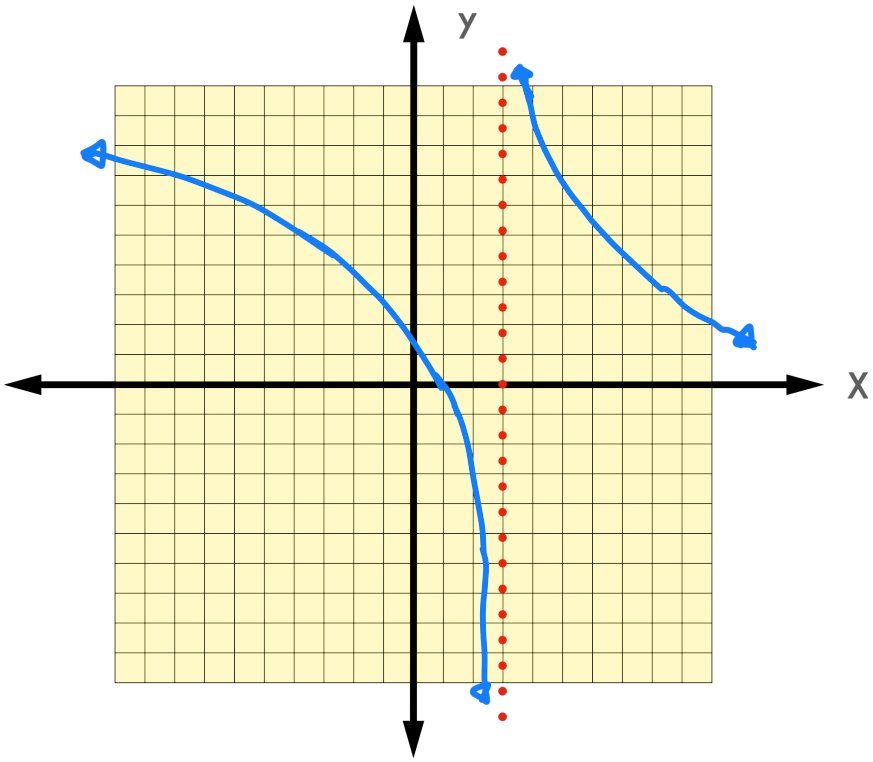
Functions with Vertical Asymptotes



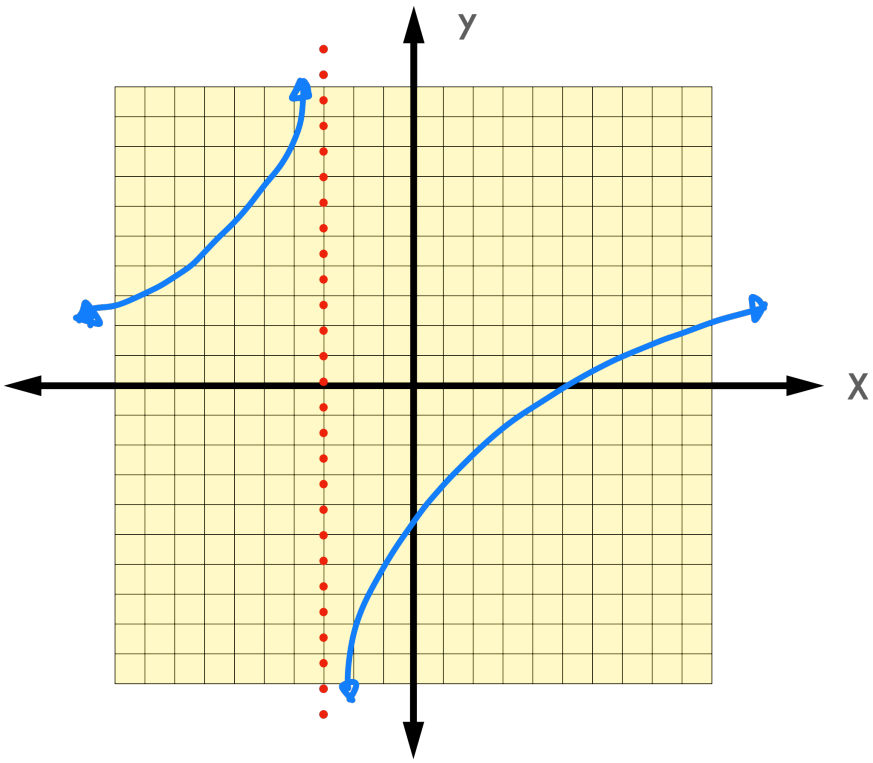
$\lim_{x \to 3} f(x) = \infty$ and $f(3) = undefined$



$\lim_{x \to -3} f(x) = -\infty$ and $f(-3) = undefined$

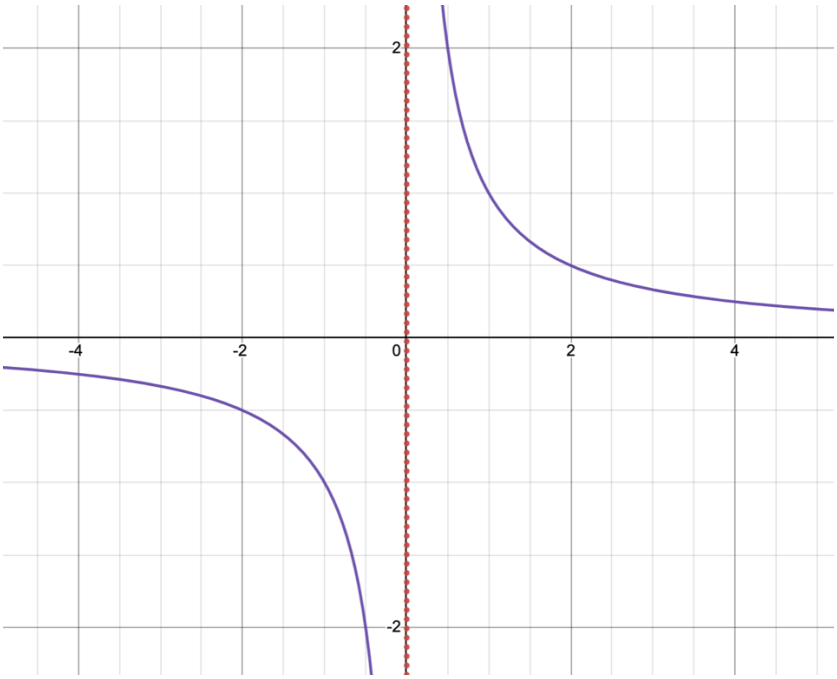


$\lim_{x \to 3} f(x) = DNE$ and $f(3) = undefined$

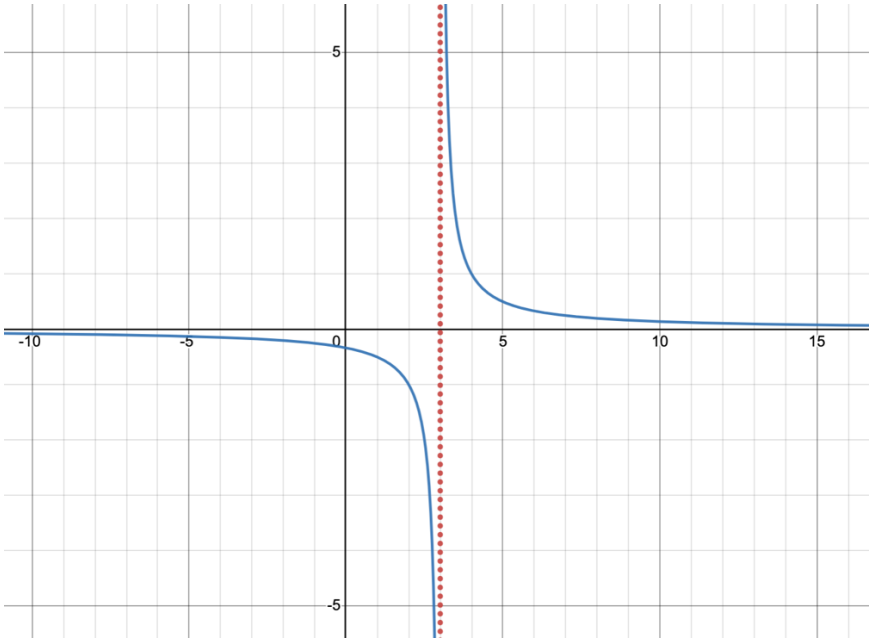


$\lim_{x \to -3} f(x) = DNE$ and $f(-3) = undefined$

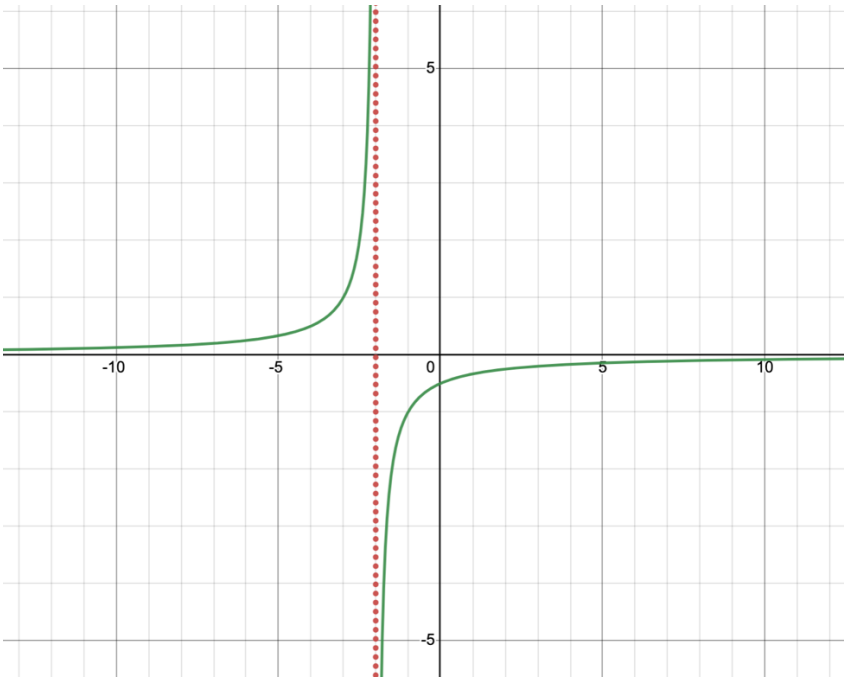
$$f(x) = \frac{1}{x}$$



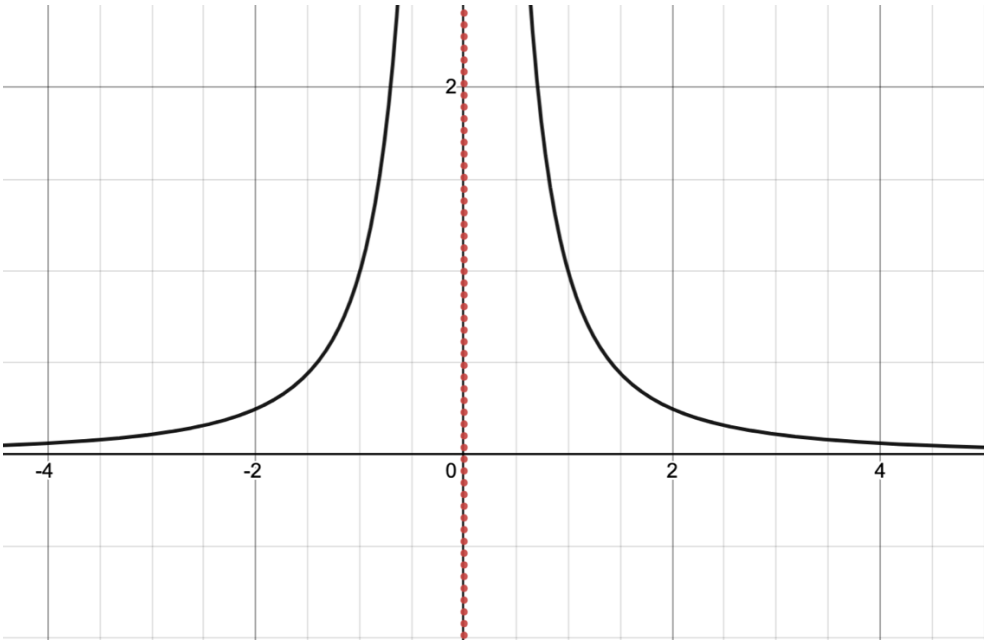
$$f(x) = \frac{1}{x-3}$$



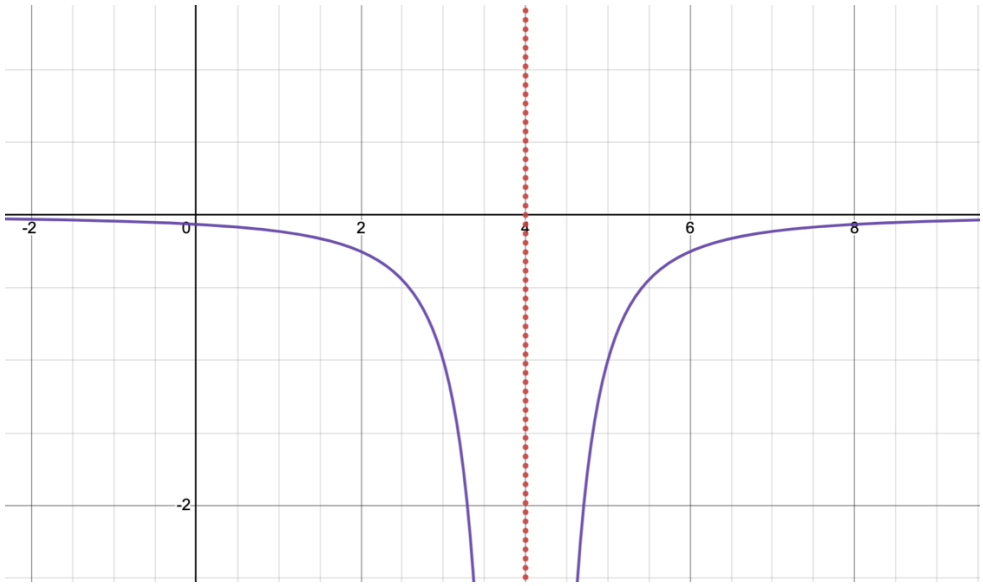
$$f(x) = -\frac{1}{x+2}$$



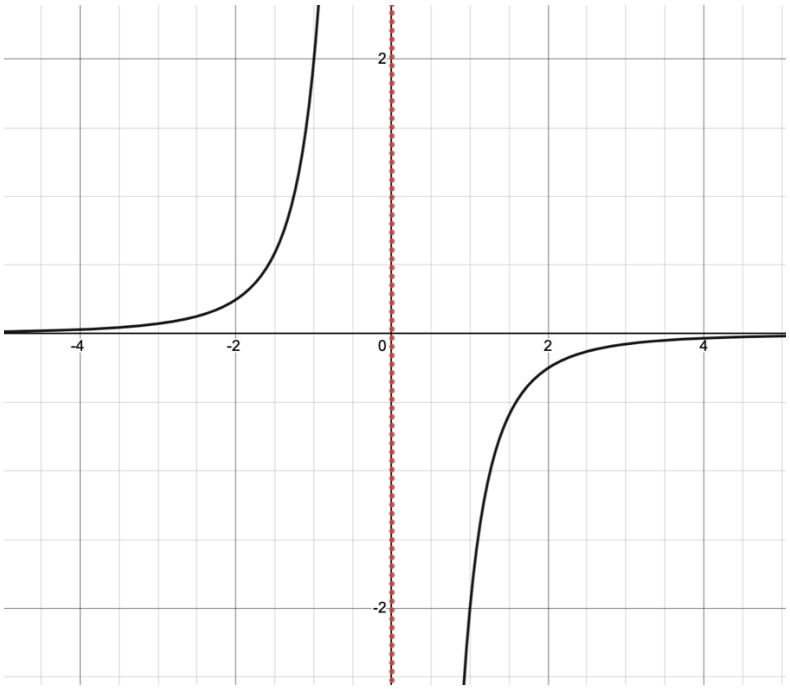
$$f(x) = \frac{1}{x^2}$$



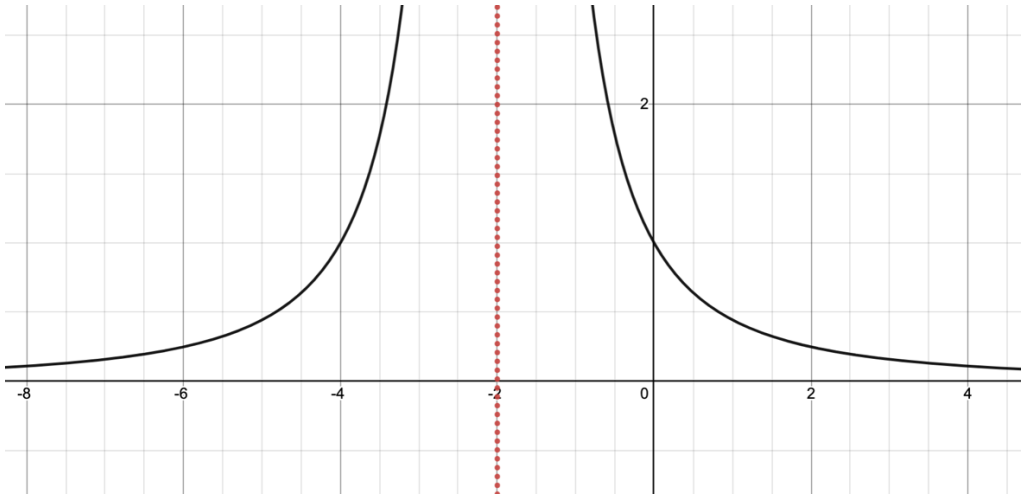
$$f(x) = -\frac{1}{(x-4)^2}$$



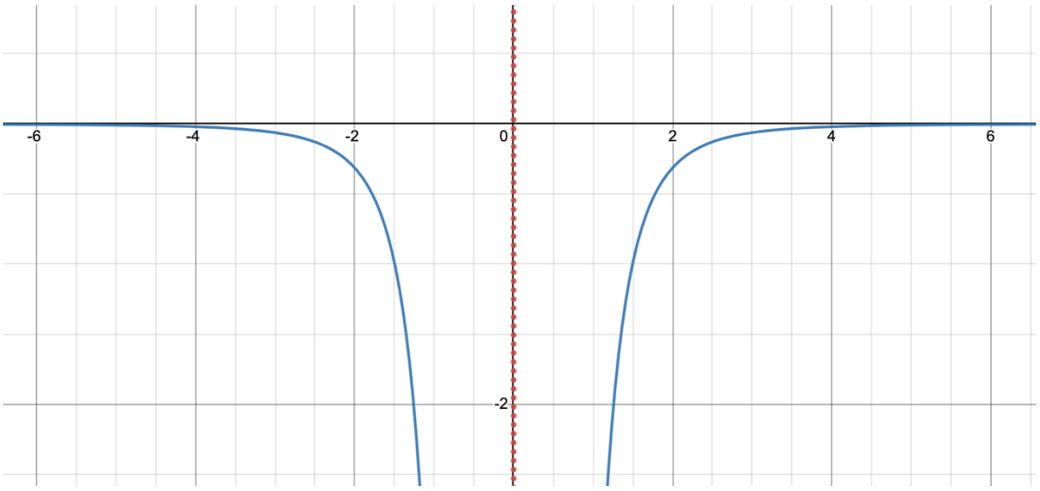
$$f(x) = -\frac{2}{x^3}$$



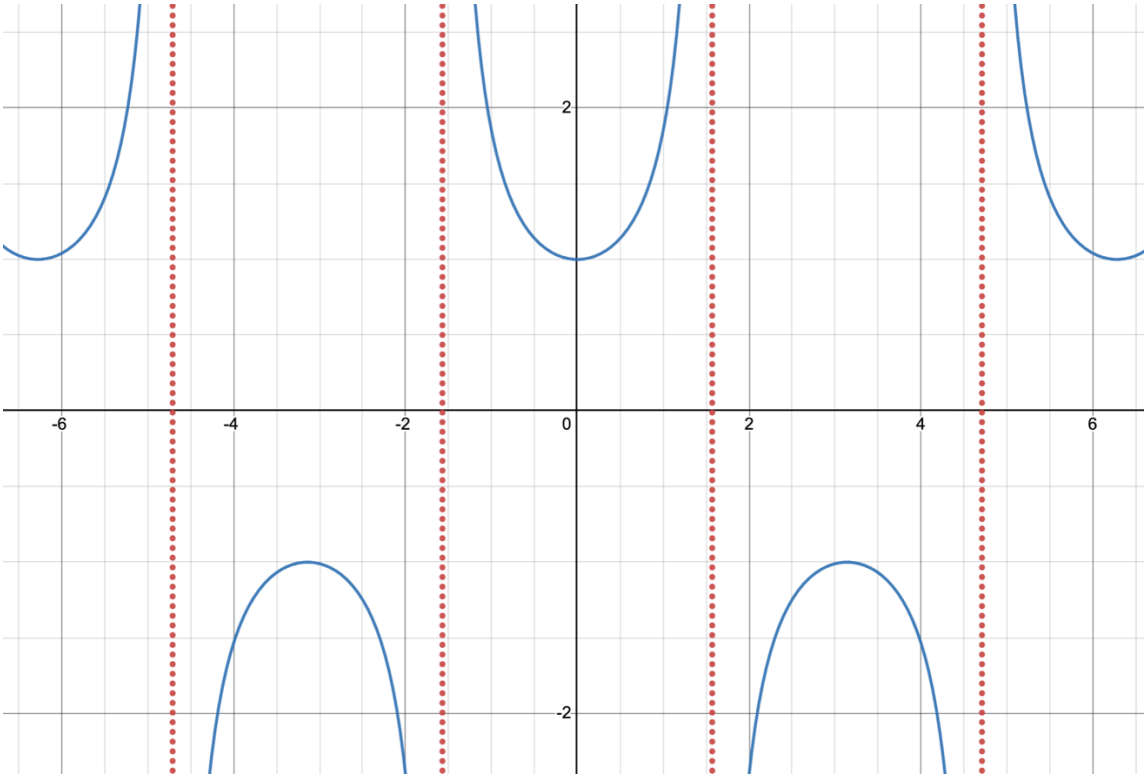
$$f(x) = \frac{4}{(x+2)^2}$$



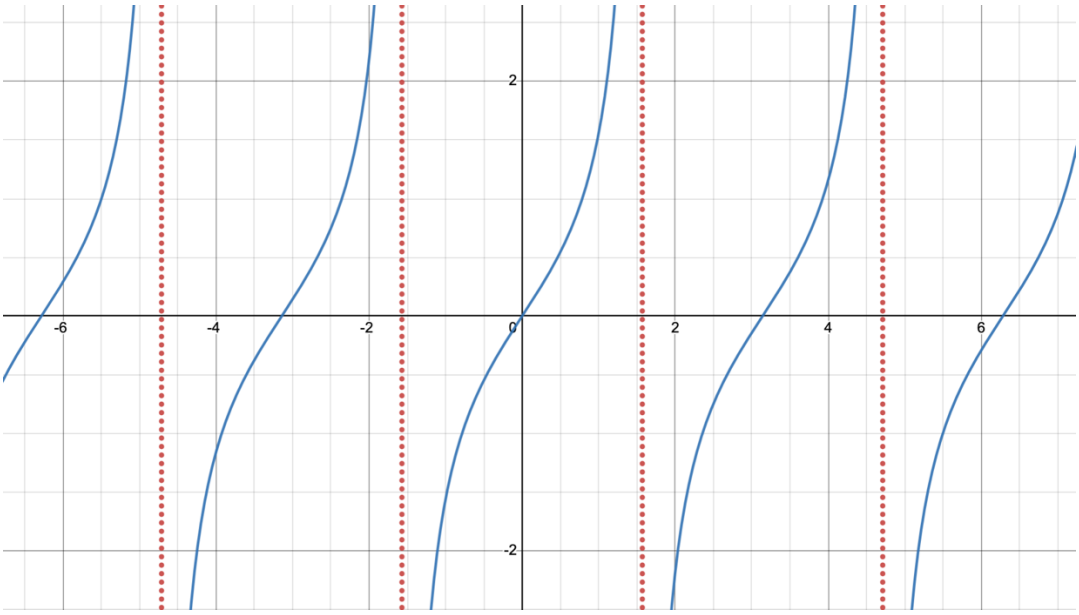
$$f(x) = -\frac{5}{x^4}$$



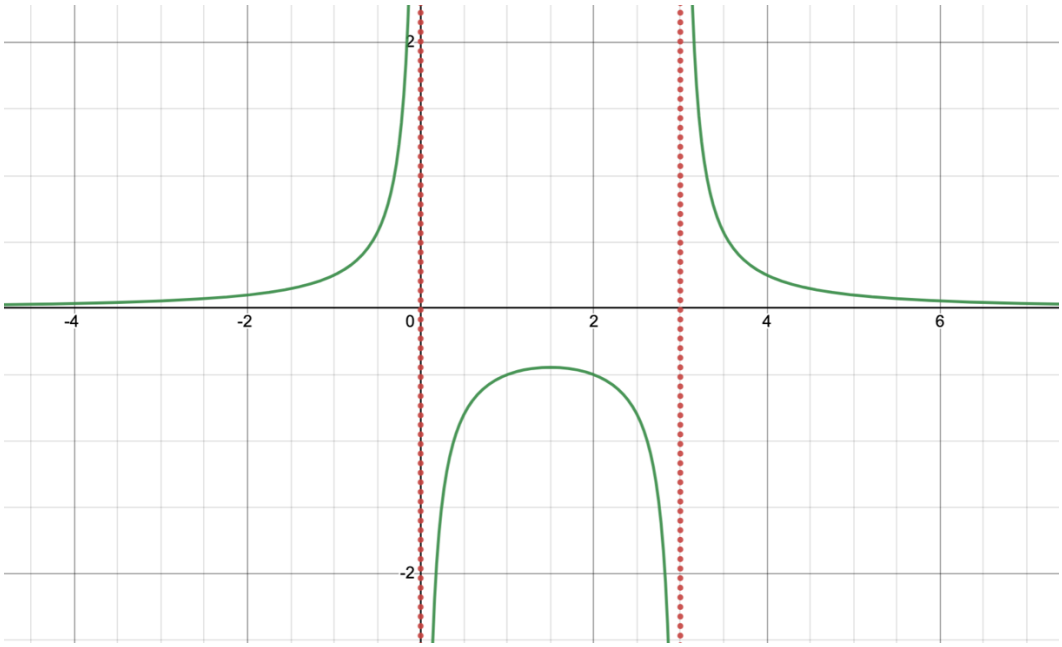
$$f(x) = \sec(x)$$



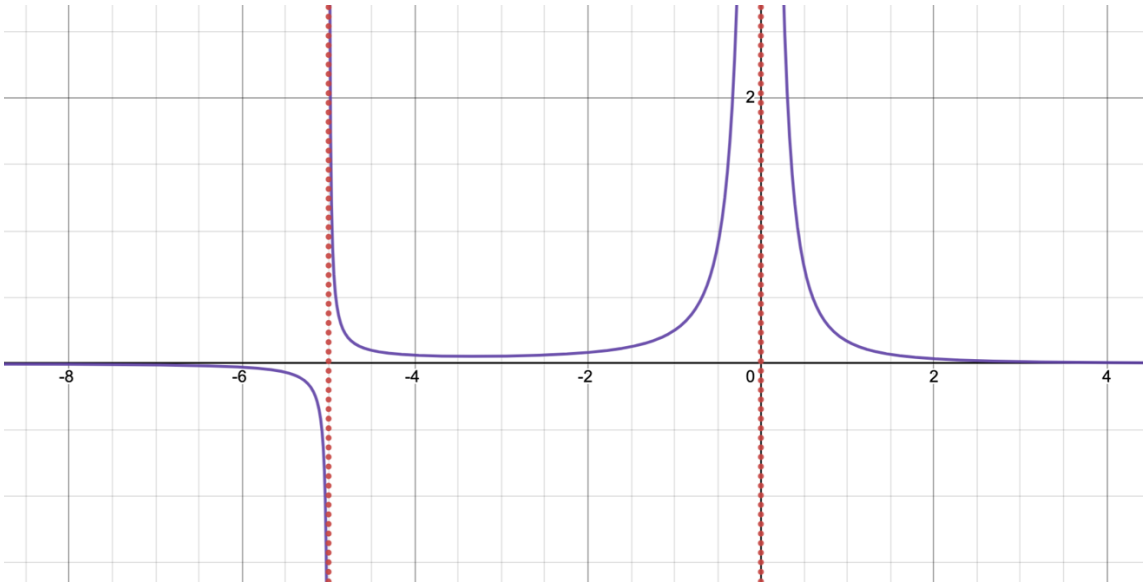
$$\boldsymbol{f(x) = \tan(x)}$$



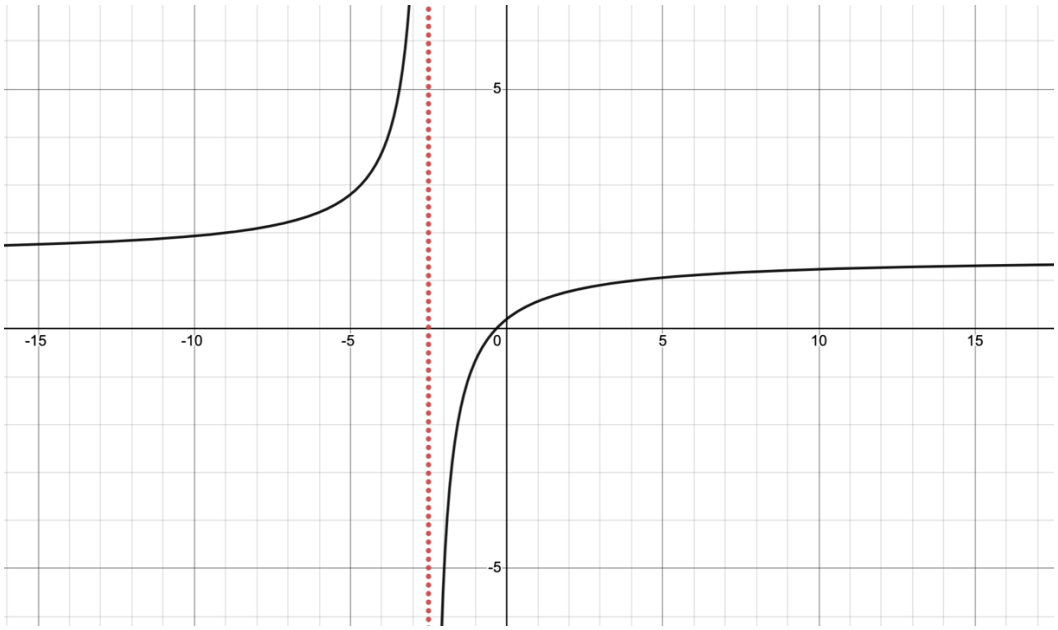
$$f(x) = \frac{1}{x(x-3)}$$



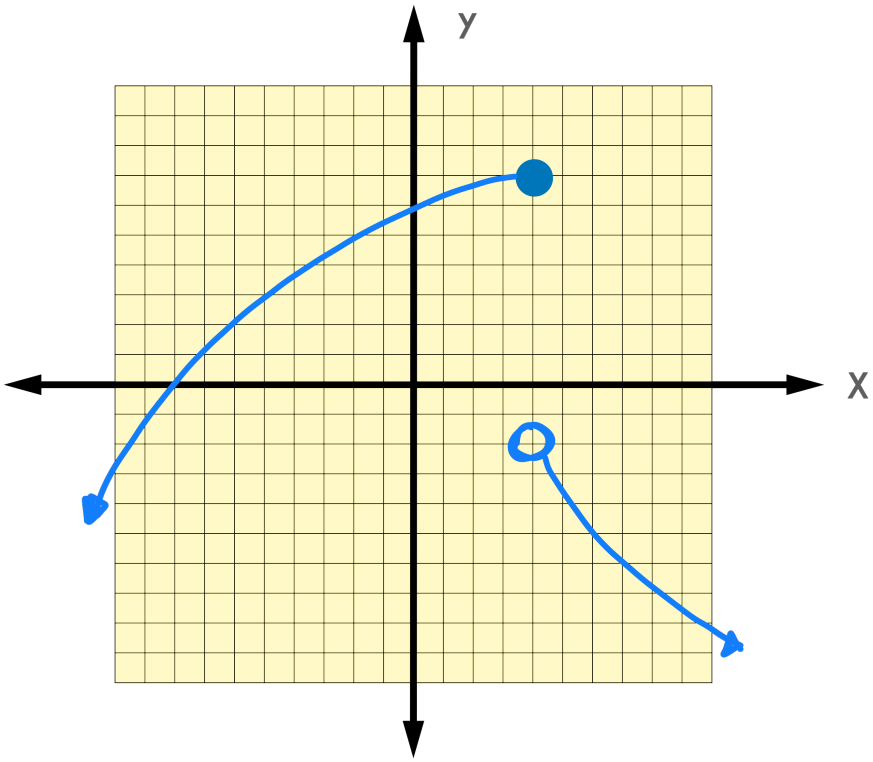
$$f(x) = \frac{1}{x^2(x+5)}$$



$$f(x) = \frac{3x + 1}{2x + 5}$$

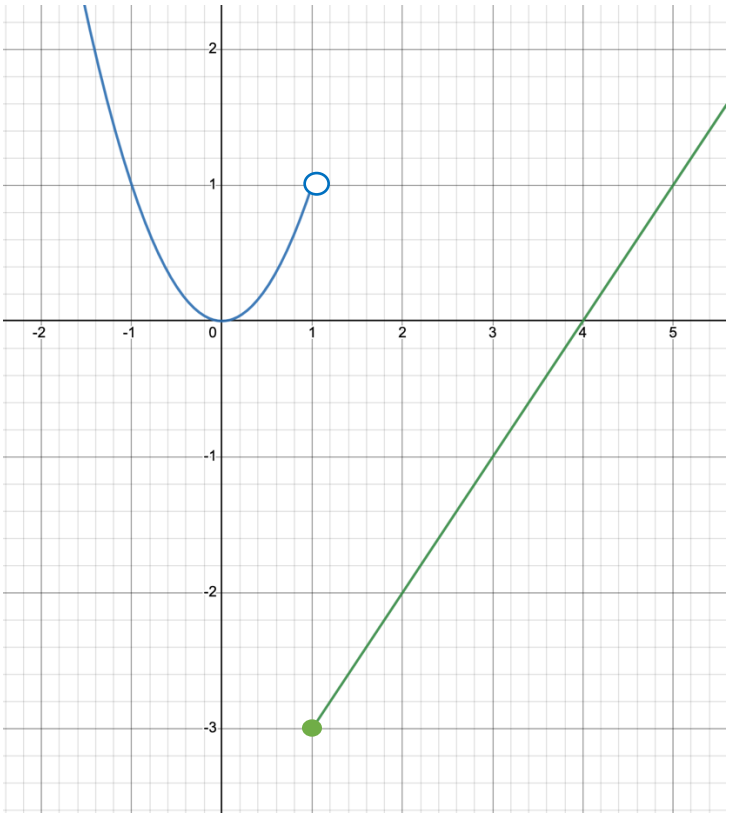


Piecewise Functions

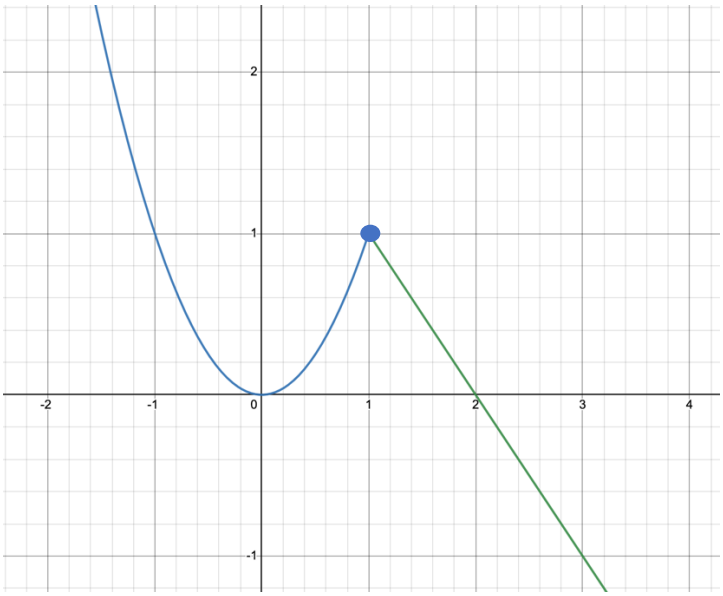


$\lim_{x \to 4} f(x) = DNE$ and $f(4) = 7$

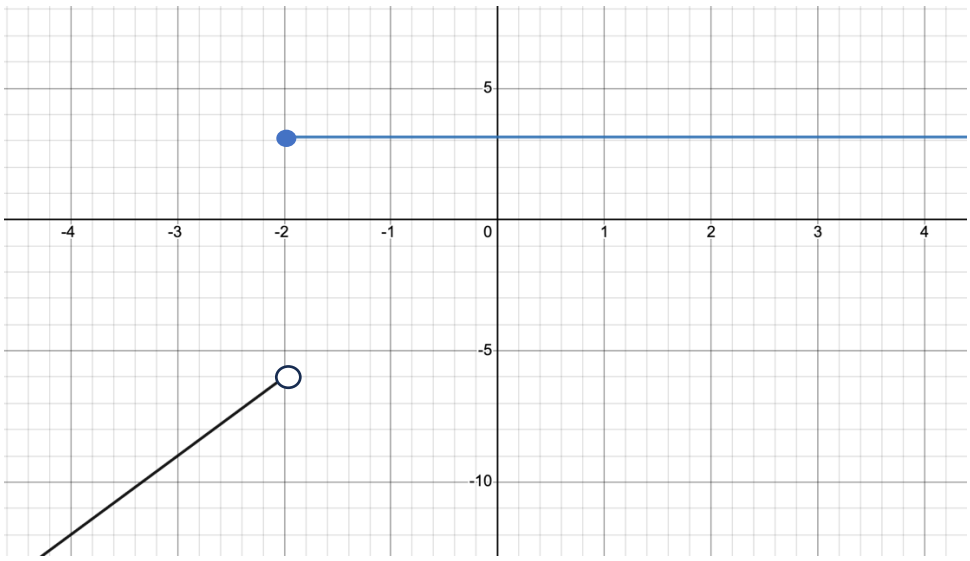
$$f(x) = \begin{cases} x^2 & for\ x < 1 \\ x - 4 & for\ x \geq 1 \end{cases}$$



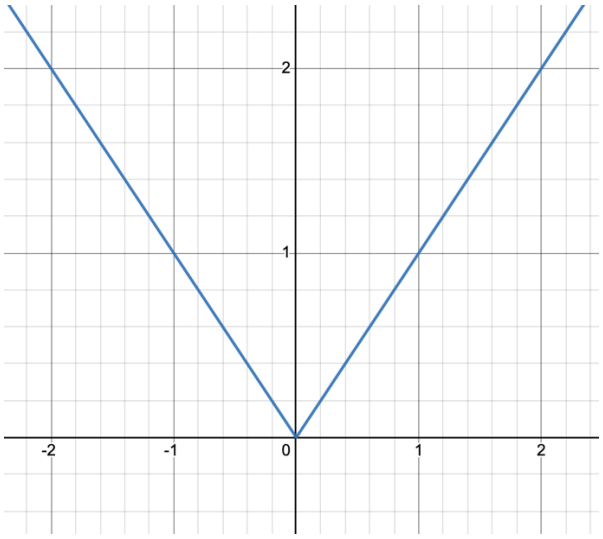
$$f(x) = \begin{cases} x^2 & for\ x \leq 1 \\ 2 - x & for\ x > 1 \end{cases}$$



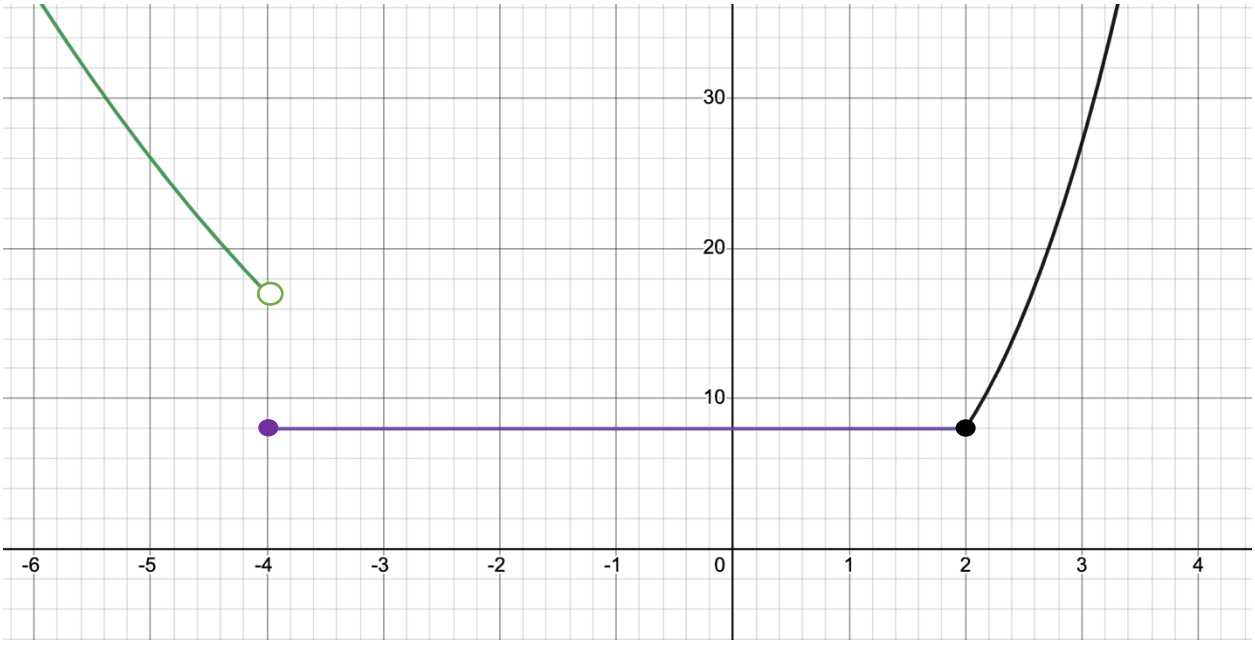
$$f(x) = \begin{cases} 3x & for\ x < -2 \\ \pi & for\ x \geq -2 \end{cases}$$



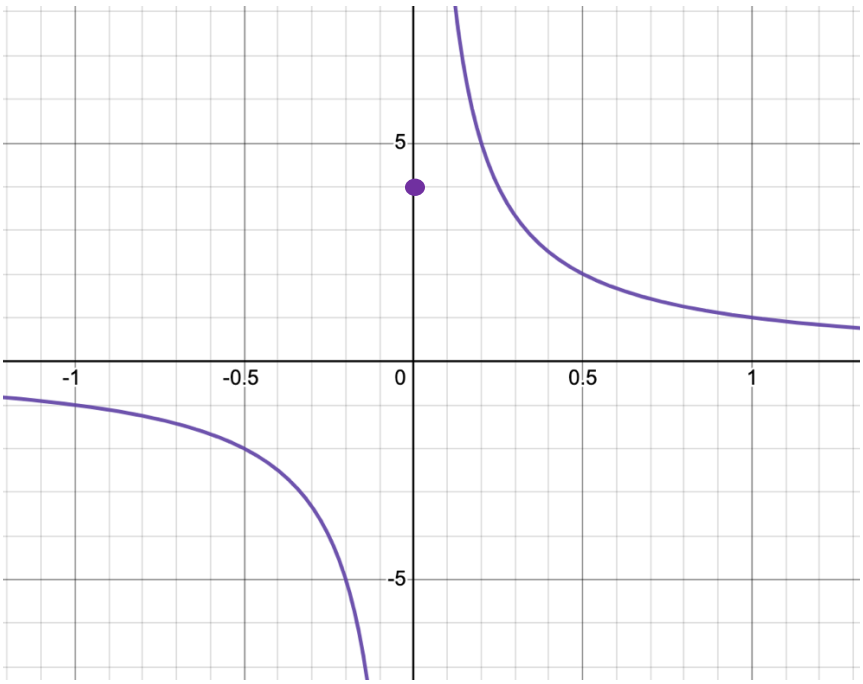
$$f(x) = |x|$$



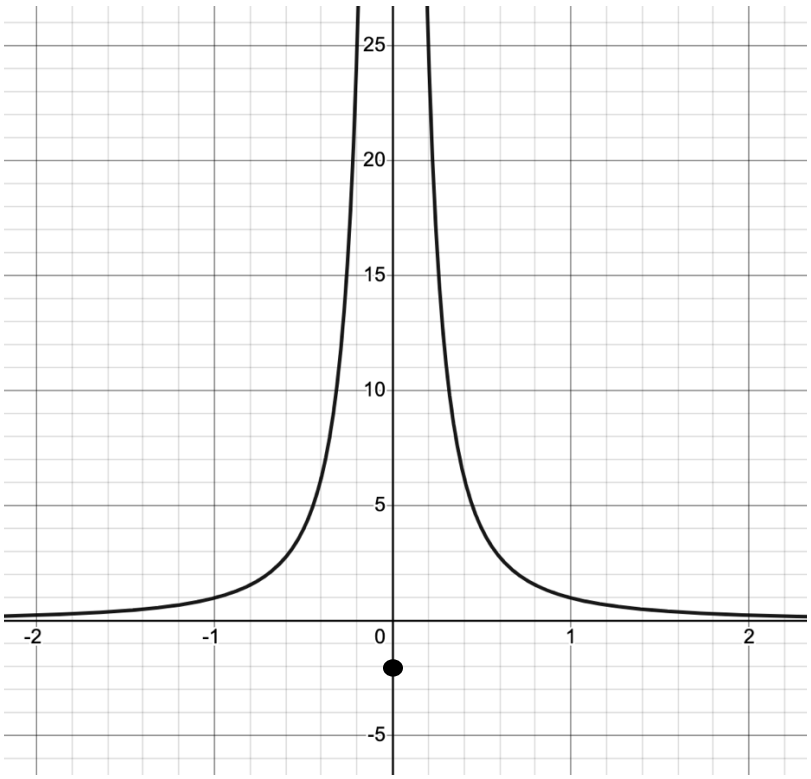
$$f(x) = \begin{cases} x^2 + 1 & x < -4 \\ 8 & -4 \leq x < 2 \\ x^3 & x \geq 2 \end{cases}$$



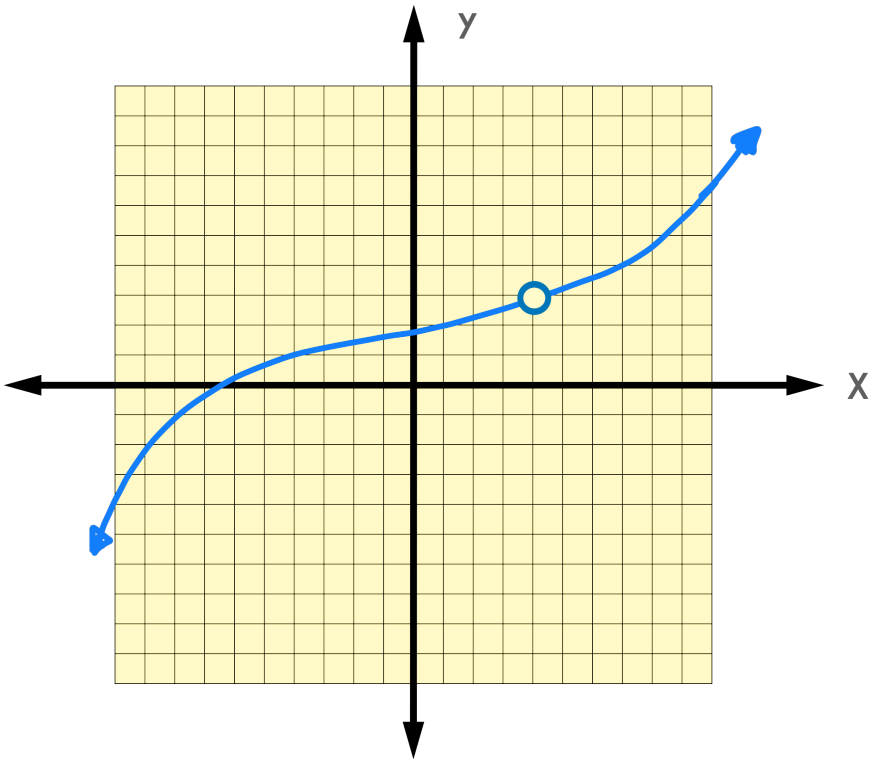
$$f(x) = \begin{cases} \frac{1}{x} & for\ x \neq 0 \\ 4 & for\ x = 0 \end{cases}$$



$$f(x) = \begin{cases} \frac{1}{x^2} & for\ x \neq 0 \\ -2 & for\ x = 0 \end{cases}$$

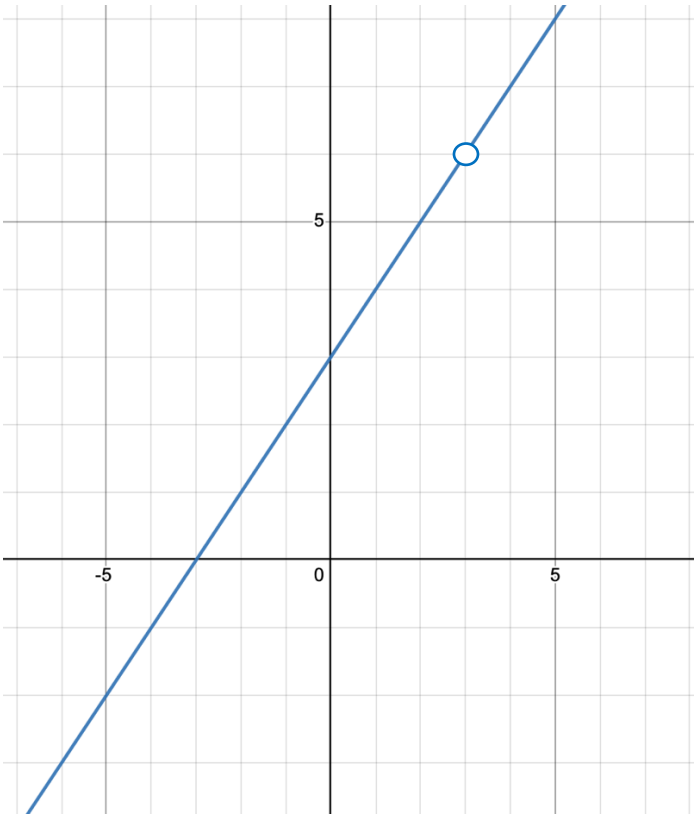


Functions with Removable Discontinuities

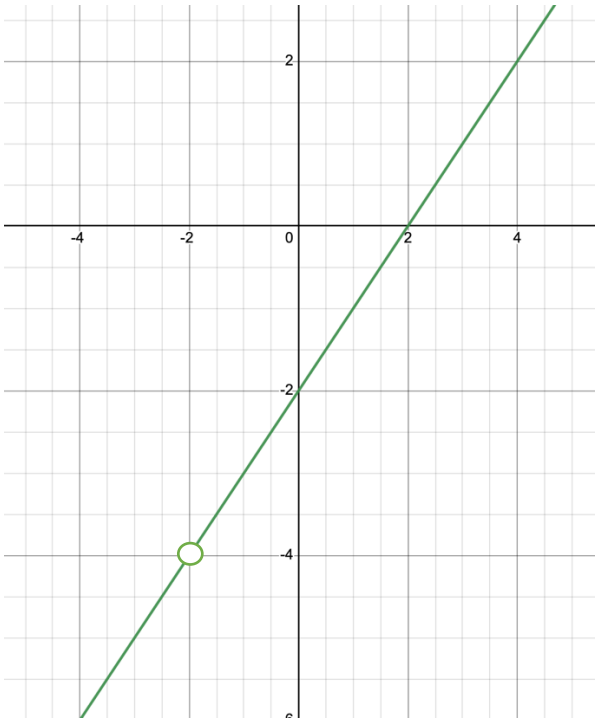


$\lim_{x \to 4} f(x) = 3$ and $f(4) = undefined$

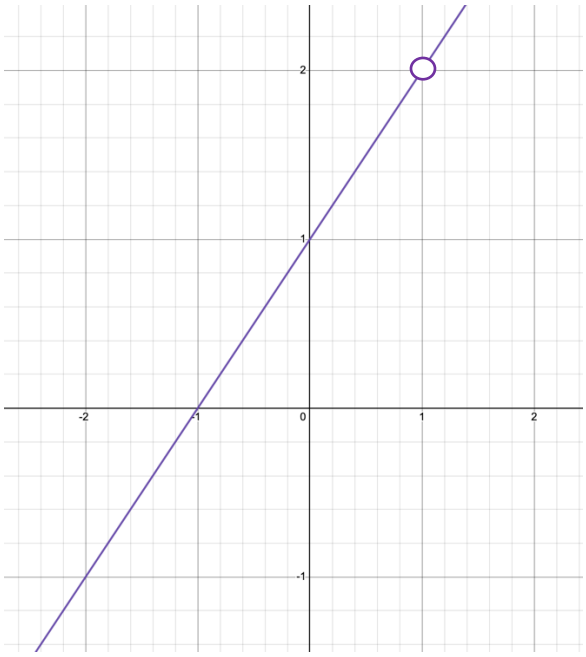
$$f(x) = \frac{x^2 - 9}{x - 3}$$



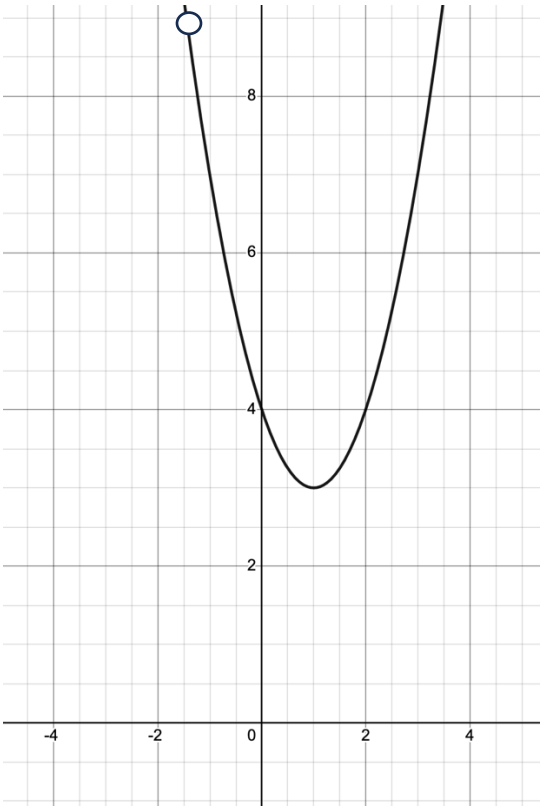
$$f(x) = \frac{x^2 - 4}{x + 2}$$

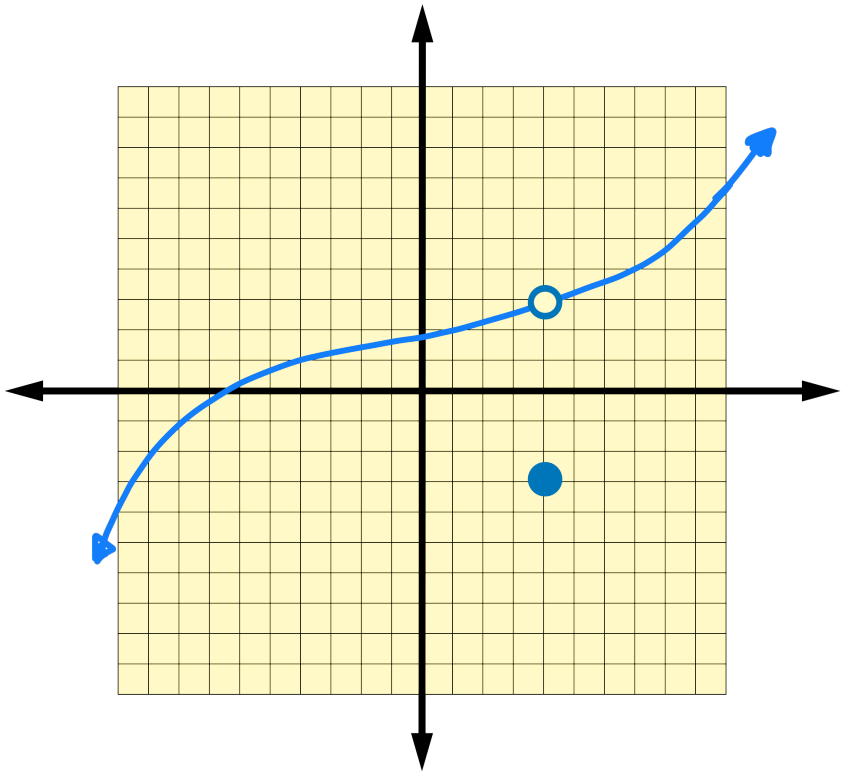


$$f(x) = \frac{x^2 - 1}{x - 1}$$



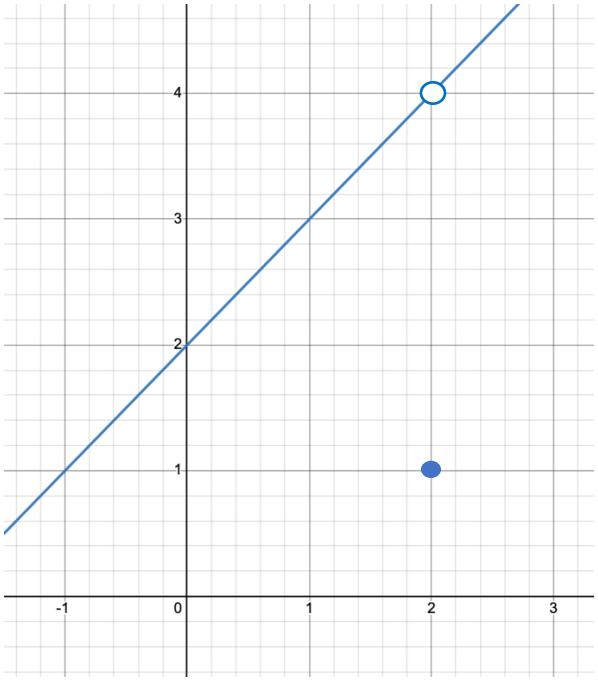
$$f(x) = \frac{x^3 + 8}{x + 2}$$



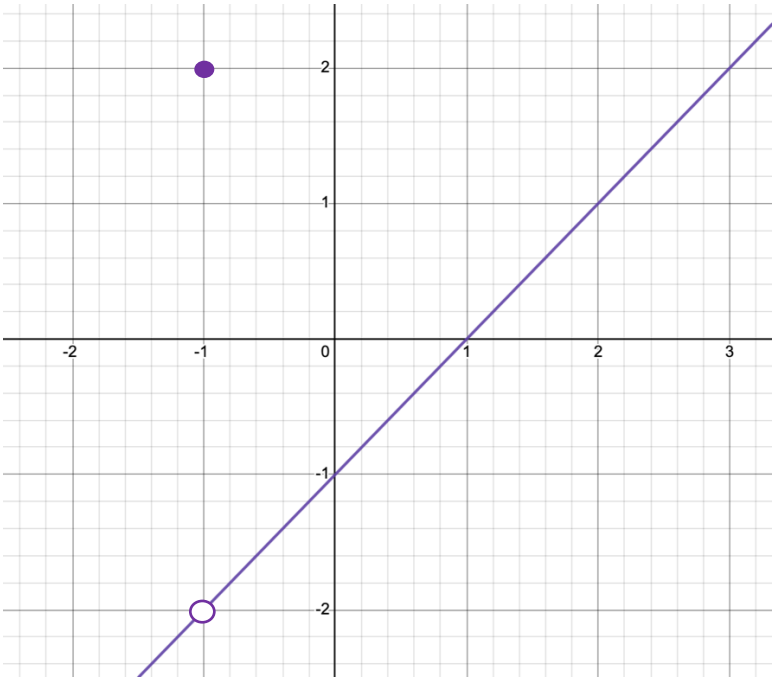


$\lim_{x \to 4} f(x) = 3$ and $f(4) = -3$

$$f(x) = \begin{cases} \dfrac{x^2 - 4}{x - 2} & for\ x \neq 2 \\ 1 & x = 2 \end{cases}$$



$$f(x) = \begin{cases} \dfrac{x^2 - 1}{x + 1} & for\ x \neq -1 \\ 2 & x = -1 \end{cases}$$



$$f(x) = \begin{cases} \dfrac{x+2}{x^3+8} & for\ x \neq -2 \\ 1 & x = -2 \end{cases}$$