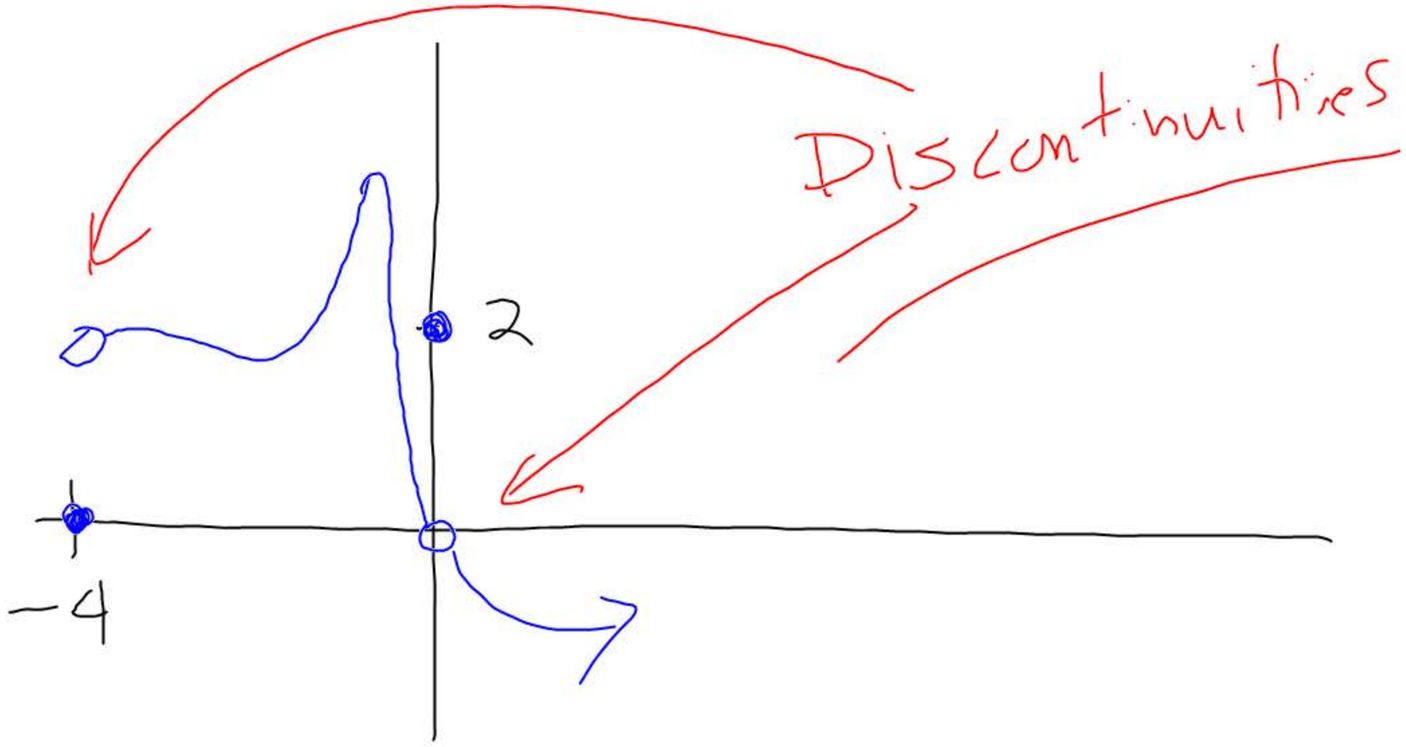
$\lim_{x \to -4^+} f(x) = 2$

$f(-4) = 0$

$\lim_{x \to 0} f(x) = 0$

$f(0) = 2$

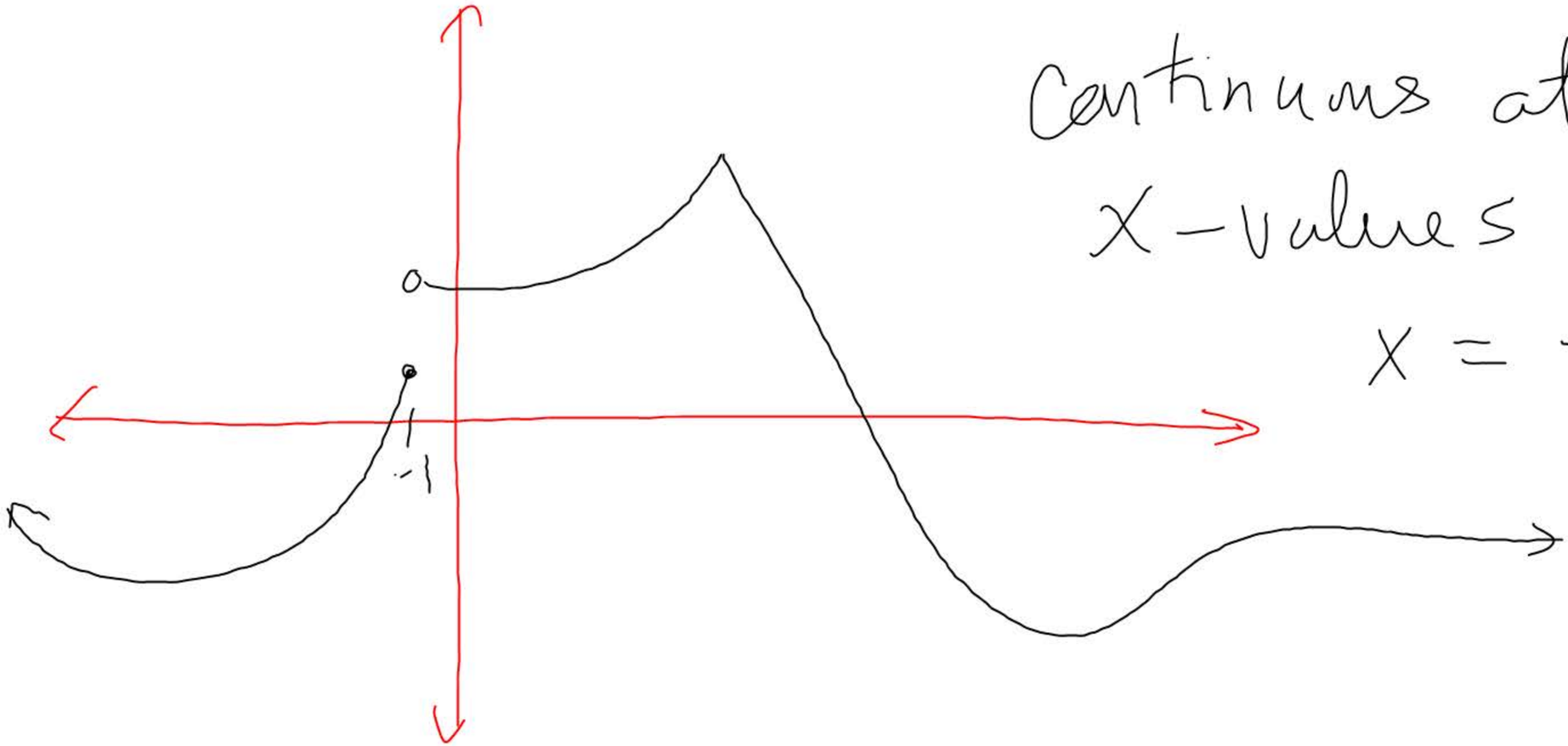


At a discontinuity,

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

A function is continuous at $x=a$ if

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



Continuous at all x-values except $x = -1$.

"Well-behaved" functions are continuous

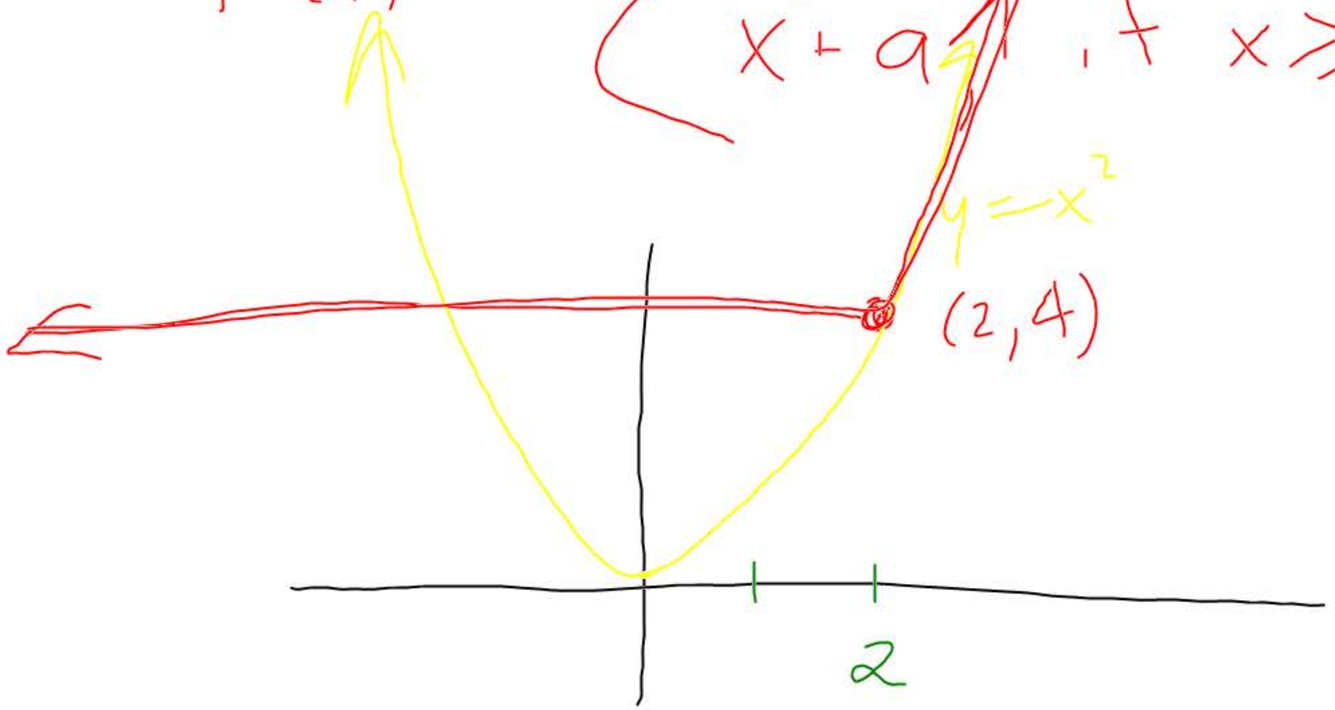
- polynomials

Not continuous everywhere: Rational

(fraction)

Find a so that this function is continuous.

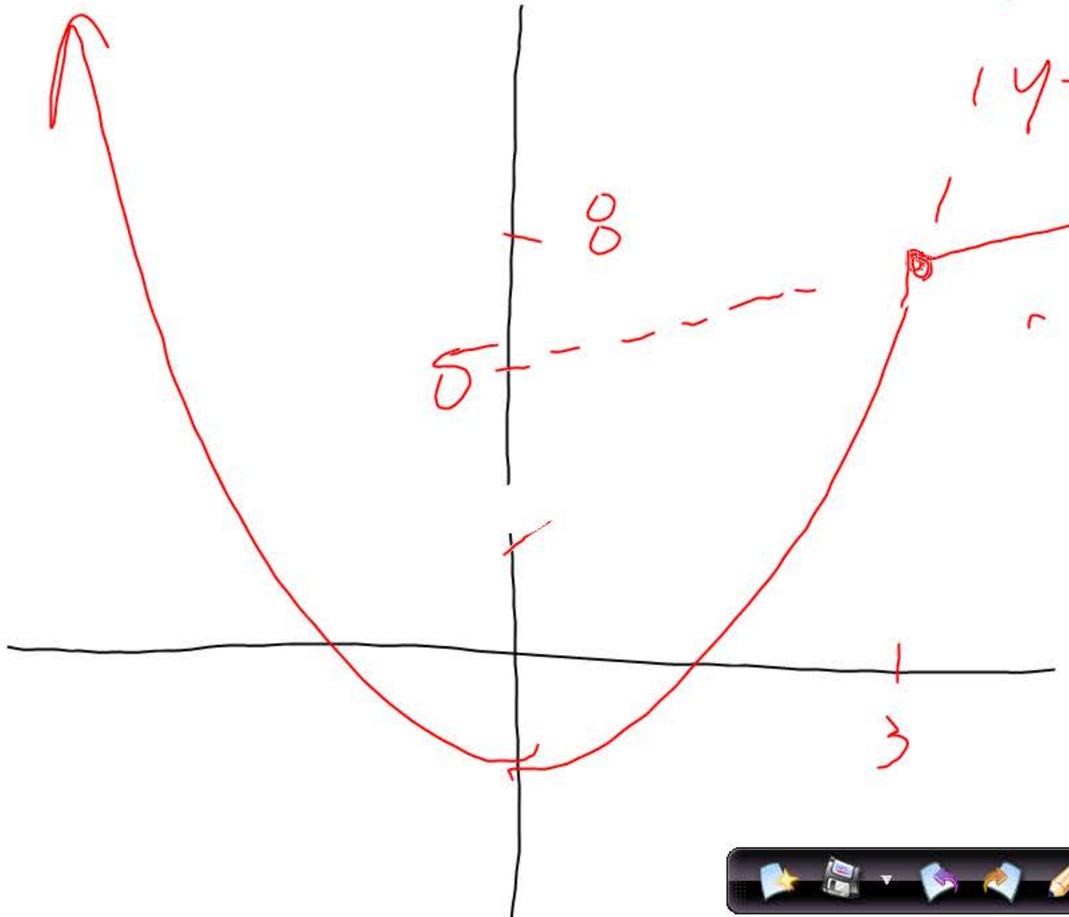
$$f(x) = \begin{cases} 4, & \text{if } x < 2 \\ x^2 + a, & \text{if } x \geq 2 \end{cases}$$



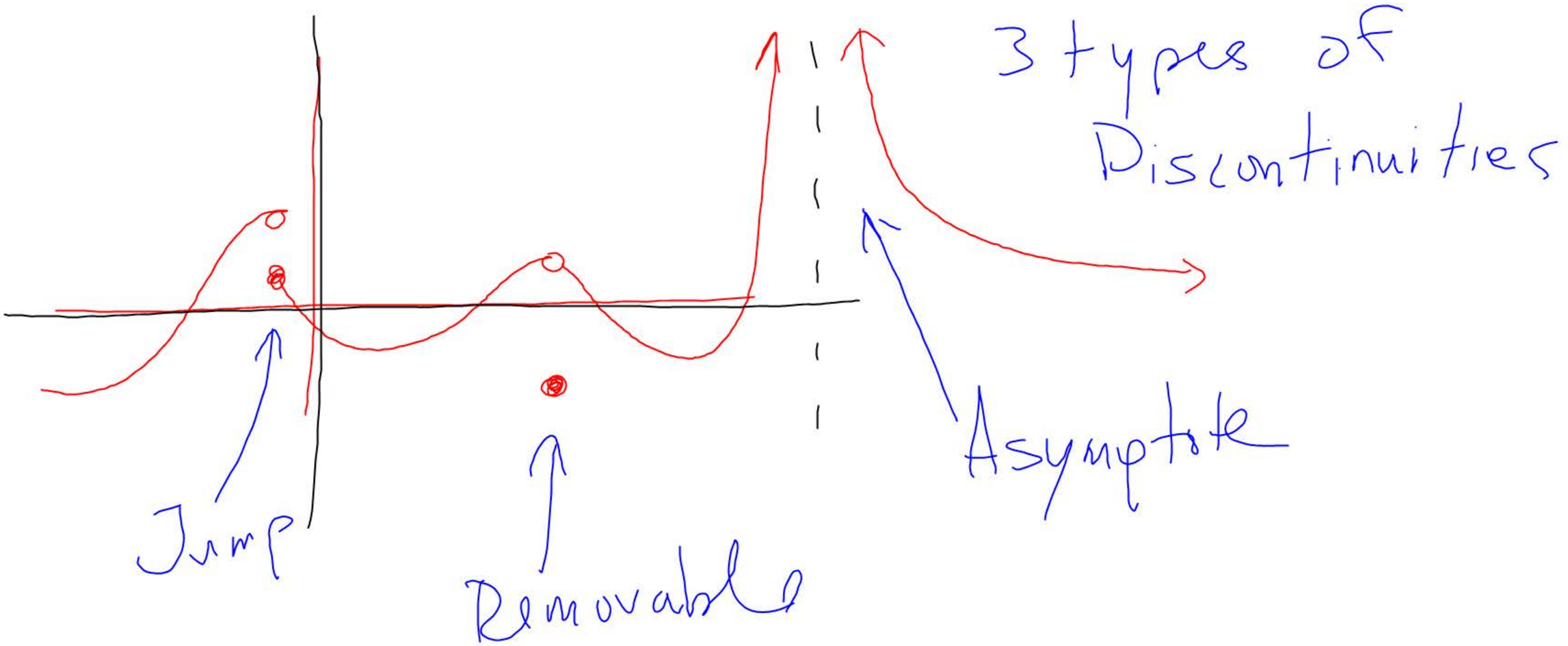
$$a = 0$$

$$f(x) = \begin{cases} x^2 - 1, & x \leq 3 \\ x + b, & x > 3 \end{cases}$$

What value of b gives a continuous $f(x)$?

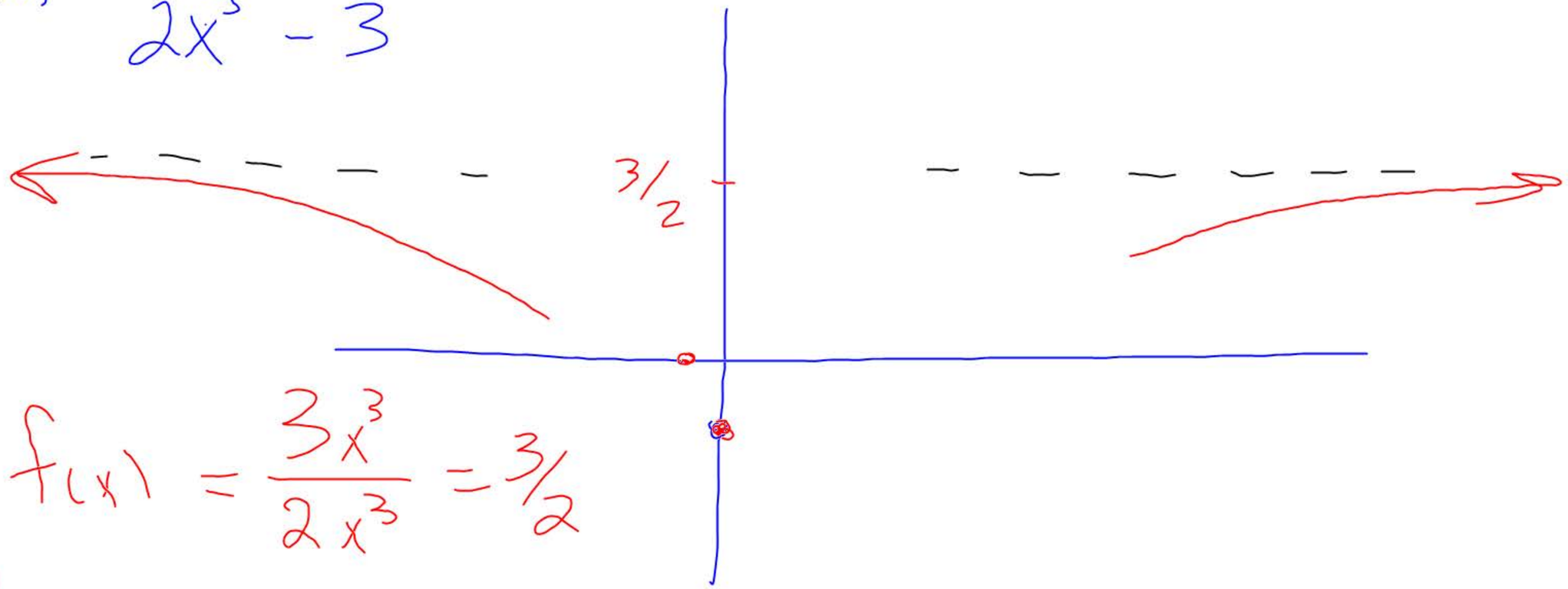


$b = 5$


3 types of Discontinuities
Jump
Removable
Asymptote

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

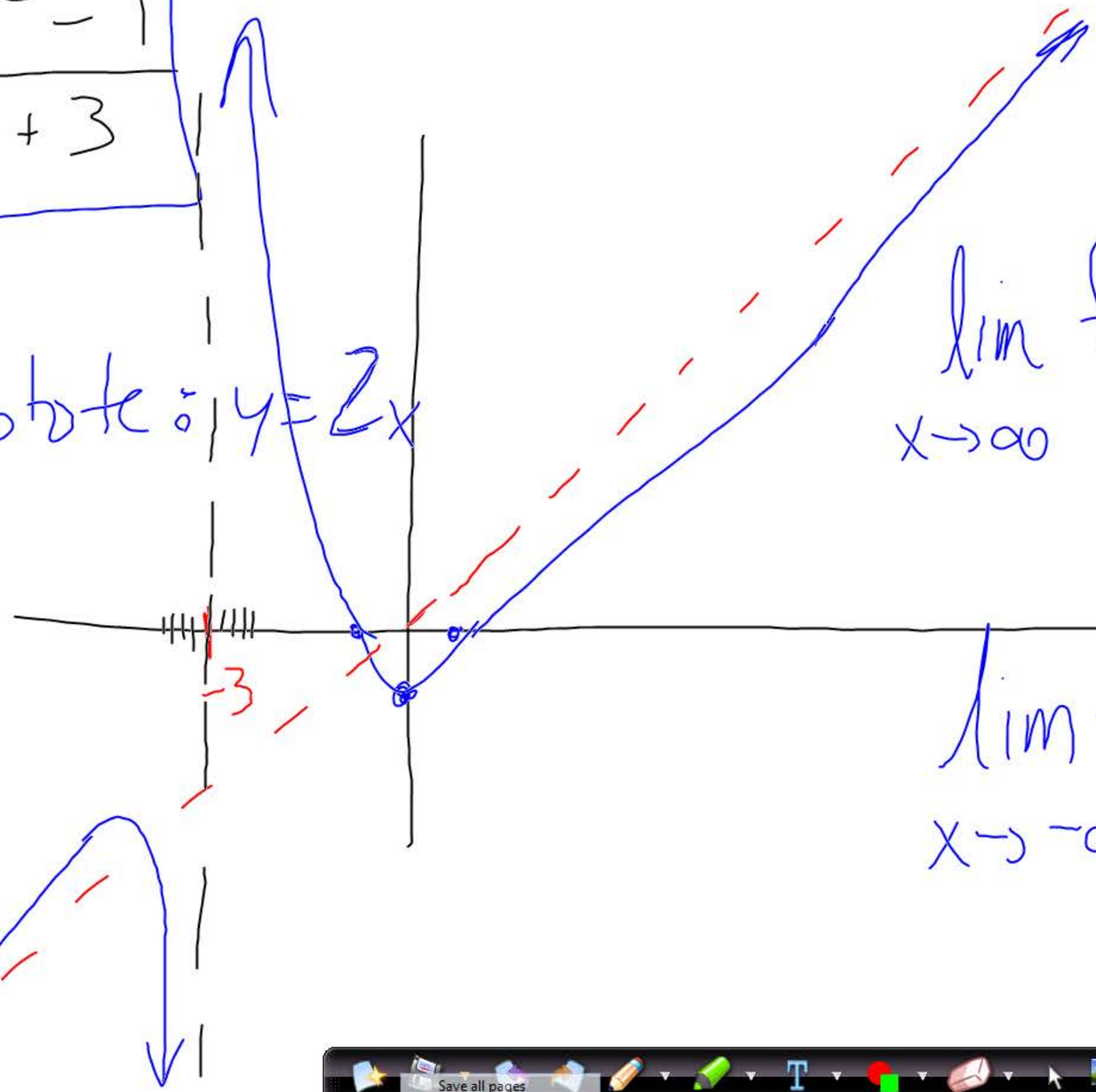
"End Behavior"



$$\lim_{x \to \infty} f(x) = \frac{3x^3}{2x^3} = 3/2$$

$$\lim_{x \to -\infty} f(x) = \frac{3x^3}{2x^3} = 3/2$$

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



slant asymptote: $y = 2x$

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

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

$\lim_{x \to -3^+} f(x) = \infty$

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