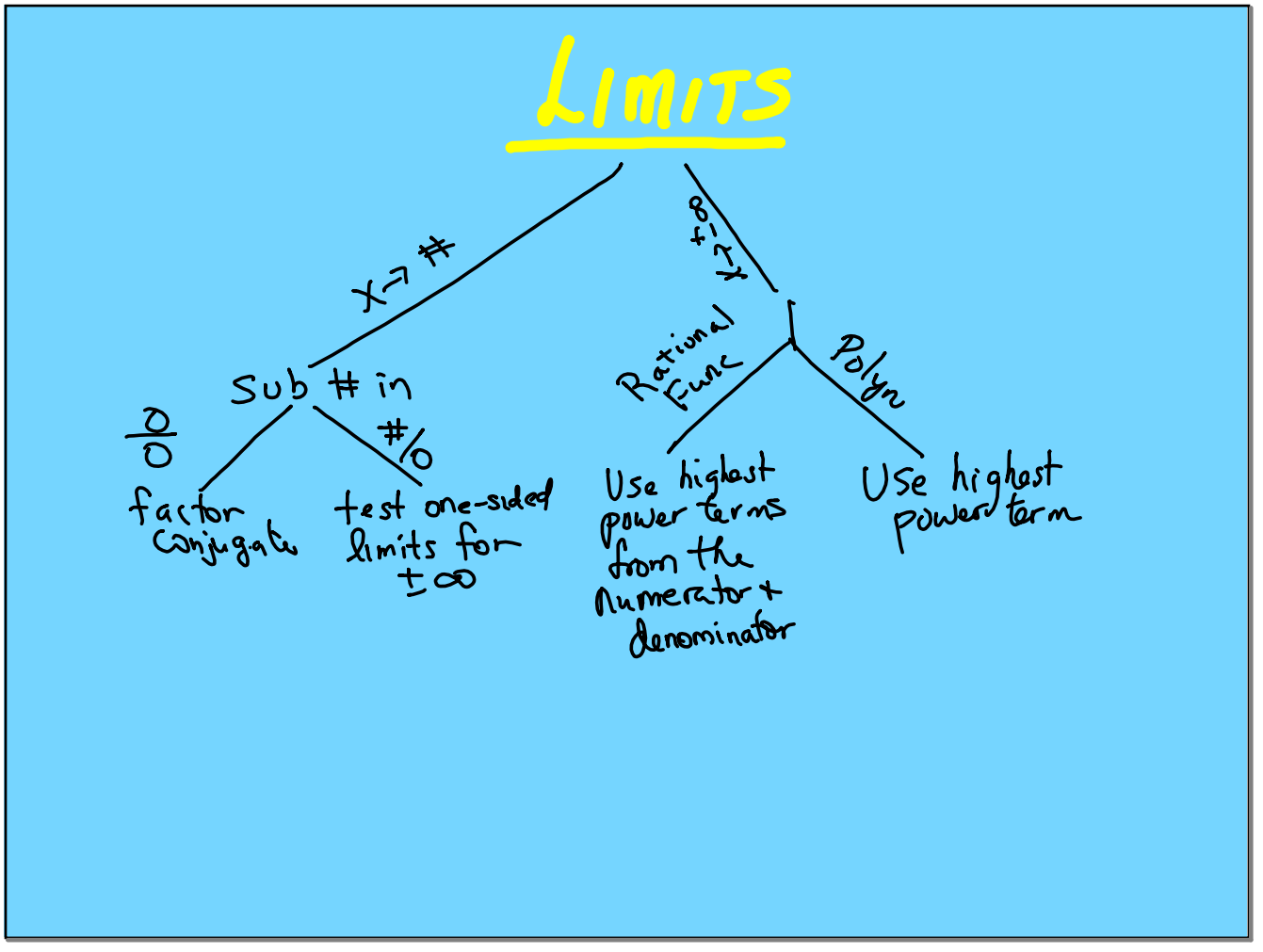

LIMITS
x→#
x→±∞
Sub # in
0/0
#/0
factor
Conjugate
test one-sided
limits for
±∞
Rational Func
Polyn
Use highest
power terms
from the
numerator &
denominator
Use highest
power term

One-Sided Limits

$$\lim_{x \to 5^-} \frac{2x+3}{x-1} = \frac{13}{4}$$

$$\lim_{x \to 2} \frac{3x}{x-2} = \frac{6}{0} = \text{DNE}$$

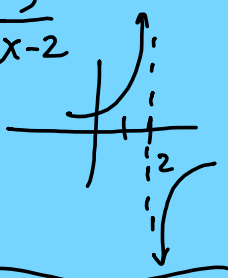
$$\lim_{x \to 2^-} \frac{3x}{x-2} = \frac{+}{-} = -\infty$$

1.9

$$\lim_{x \to 2^+} \frac{3x}{x-2} = \frac{+}{+} = +\infty$$

2.1

$y = \frac{3}{x-2}$



$$\lim_{x \to 4} \frac{8x^2}{(x-4)^4} = \frac{128}{0} = +\infty$$

$$\lim_{x \to 4^-} \frac{8x^2}{(x-4)^4} = \frac{+}{+} = +\infty$$

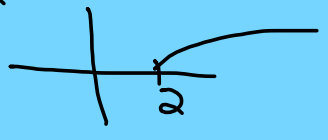
$$\lim_{x \to 4^+} \frac{8x^2}{(x-4)^4} = \frac{+}{+} = +\infty$$

$$\lim_{x \to -3^+} \frac{8x}{(x+3)^2} = \frac{-24}{0}$$

$$= \frac{-}{+} = -\infty$$

-2.9

$$\lim_{x \to 2^-} \sqrt{x-2} = \text{DNE}$$



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

$$\lim_{x \to -1} f(x) = \frac{1}{4}$$

$$\lim_{x \to -1^-} \frac{2x+1}{3x-1} = \frac{-2+1}{-3-1} = \frac{+1}{+4}$$

$$\lim_{x \to -1^+} \frac{1}{(x-1)^2} = \frac{1}{(-2)^2} = \frac{1}{4}$$

$$\lim_{x \to 3} \frac{1}{(x-1)^2} = \frac{1}{4}$$

$$f(x) = \begin{cases} x^2 - 3 & x < 2 \\ 4x+7 & x = 2 \\ \frac{2}{x-2} & x > 2 \end{cases}$$

$$\lim_{x \to 2} f(x) = \text{DNE}$$

$$\lim_{x \to 2^-} x^2 - 3 = 2^2 - 3 = 1$$

$$\lim_{x \to 2^+} \frac{2}{x-2} = \frac{2}{2-2} = \frac{2}{0} = \frac{+}{+} = +\infty$$

2.1

Limits to ±∞ rigorous

$$\lim_{x\to\infty} \frac{x^2}{7x^2+3} = \frac{\infty^2}{7\infty^2+3}$$

$$\lim_{x\to\infty} \frac{\frac{1}{x^2}\,x^2}{\frac{1}{x^2}\,7x^2+3}$$

$$\lim_{x\to\infty} \frac{\frac{x^2}{x^2}}{\frac{7x^2}{x^2}+\frac{3}{x^2}}$$

$$\lim_{x\to\infty} \frac{1}{7+3/x^2} = \frac{1}{7+3/\infty^2 \to 0} = \boxed{\frac{1}{7}}$$

$$\lim_{x\to\infty} \frac{x^2}{7x^2} = \frac{1}{7}$$

$$\lim_{x\to-\infty} \frac{4x^3-3x^2+1}{5x^4+2x^2-9}$$

$$\lim_{x\to-\infty} \frac{4x^3}{5x^4} = \lim_{x\to-\infty} \frac{4}{5x} = \frac{4}{-\infty} = 0$$

$$\lim_{y\to-\infty}\frac{5y^3+4}{3y+7}=\lim_{y\to-\infty}\frac{5y^3}{3y}=\lim_{y\to-\infty}\frac{5}{3}y^2=\frac{5}{3}(-\infty)^2=\infty$$

$$\lim_{x\to-\infty}\frac{\sqrt{x^2+13}}{6x+5}=\lim_{x\to-\infty}\frac{\sqrt[2]{x^2}}{6x}=\lim_{x\to-\infty}\frac{|x|}{6x}=\lim_{x\to-\infty}\frac{-x}{6x}=-\frac{1}{6}$$

even-even-odd

$$\lim_{z\to-\infty}-3z^2-7z=\lim_{z\to-\infty}-3z^2=-3(-\infty)^2=-3\cdot+\infty=-\infty$$