September 1, 2023

LIMITS

$\lim_{x \to 4^-} f(x) = 6$

$\lim_{x \to 4^+} f(x) = 6$

$\lim_{x \to 4} f(x) = 6$

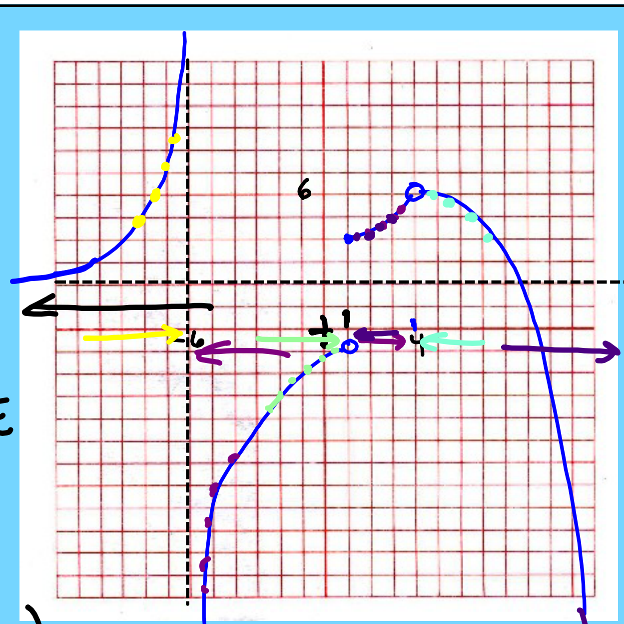
$f(4) = \text{undefined}$

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

$\lim_{x \to 1^+} f(x) = 4$

$\lim_{x \to 1} f(x) = \text{DNE}$

$f(1) = 4$



Limits - find what value the y-coord is approaching when x approaches a given number.

$\lim_{x \to -6^-} f(x) = +\infty$

$\lim_{x \to -6^+} f(x) = -\infty$

$\lim_{x \to -6} f(x) = \text{DNE}$

$\lim_{x \to -\infty} f(x) = 2$

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

Domain: $[-5, \infty)$

$f(-2) = \text{undef}$ ← hole asymp.

$f(3) = 1$ $(3, 1)$

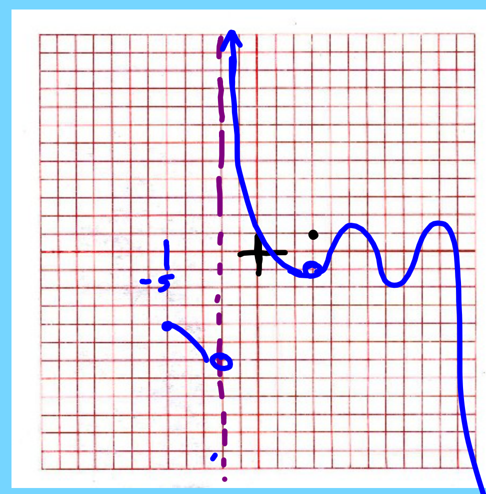
$\lim_{x \to -2^+} f(x) = +\infty$

$\lim_{x \to -2} f(x) = \text{DNE}$ ← L & R go to diff. y-coord

$x \to -2$ ← both sides

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

$x \to 3$ ← both sides



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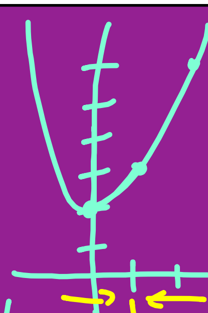
$$\lim_{x\to 1} x^2+2 = 3$$



$$\lim_{x\to 2} \frac{3x^2-4x-4}{x-2} = \frac{12-8-4}{0} = \frac{0}{0} \leftarrow$$ indeterminate form

$$\lim_{x\to 2} \frac{(3x+2)\cancel{(x-2)}}{\cancel{x-2}} = 3(2)+2 = \boxed{8}$$

$$\lim_{x\to 3} \frac{x^2-4x+3}{x^3-27} = \frac{9-12+3}{27-27} = \frac{0}{0}$$

$$\lim_{x\to 3} \frac{\cancel{(x-3)}(x-1)}{\cancel{(x-3)}(x^2+3x+9)} = \frac{3-1}{9+9+9} = \boxed{\frac{2}{27}}$$

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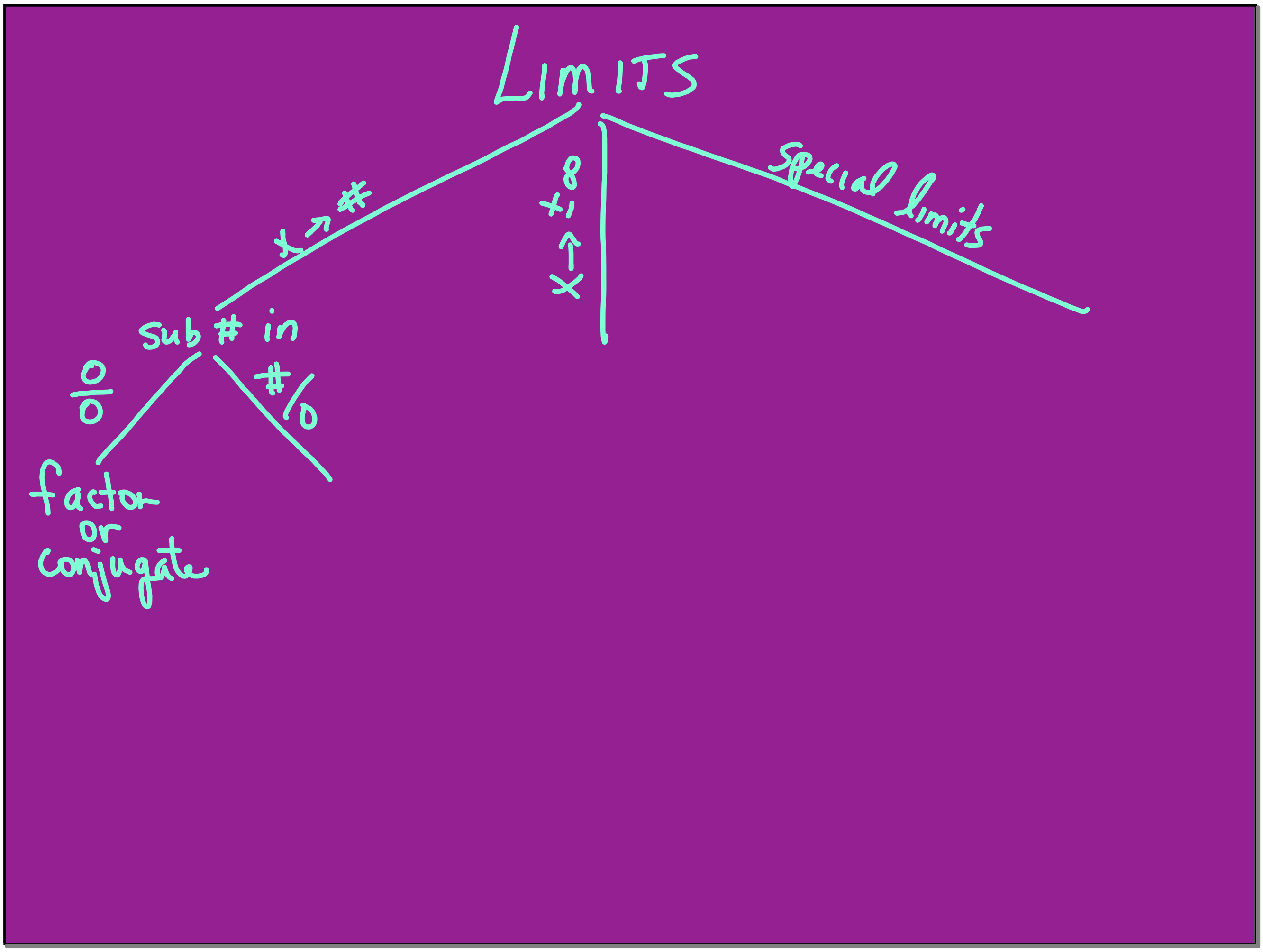

$$\lim_{h\to 0} \frac{\sqrt{9+h}-3\,(\sqrt{9+h}+3)}{h\,(\sqrt{9+h}+3)} = \frac{\sqrt{9}-3}{0} = \frac{0}{0}$$

$$\frac{4}{4+\sqrt{2}\,(4-\sqrt{2})}$$

$$\lim_{h\to 0} \frac{\cancel{9}+\cancel{h}-\cancel{9}}{\cancel{h}\,(\sqrt{9+h}+3)} = \frac{1}{\sqrt{9}+3} = \frac{1}{6}$$

$$\lim_{x\to 4} \frac{(3x^3-12x^2)+(5x-20)(\sqrt{x}+2)}{\sqrt{x}-2\,(\sqrt{x}+2)} = \frac{192-192+20-20}{0} = \frac{0}{0}$$

$$\lim_{x\to 4} \frac{(\sqrt{x}+2)\left[3x^2(x-4)+5(x-4)\right]}{x-4}$$

$$\lim_{x\to 4} \frac{(\sqrt{x}+2)\cancel{(x-4)}(3x^2+5)}{\cancel{x-4}} = \frac{(4)(53)}{1} = 212$$