Period 3, Sept 4, 2024

5. Find the following limits. Show your work.

a) $\lim_{x\to 5^+} \frac{3x-5}{5-x}$

b) $\lim_{x\to 2} \frac{3}{(x-2)^2}$ = DNE Because it goes to

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

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

c) $f(x) = \frac{x^2-3x-4}{x^2-16} = \frac{(x-4)(x+1)}{(x-4)(x+4)}$

$\lim_{x\to 4} \frac{(x-4)(x+1)}{(x-4)(x+4)} = \frac{5}{8}$ Not continuous (hole) "Removable"

$\lim_{x\to -4} \frac{(x-4)(x+1)}{(x-4)(x+4)} = \frac{-3}{\pm RSN} = \pm\infty = DNE$

Vertical asy at $x=-4$

End behavior

1. $f(x) = \frac{2x-1}{4x^2-3}$ $= \lim_{x\to\infty} \frac{2x-1}{4x^2-3} = \lim_{x\to\infty} \frac{2x}{4x^2} = \lim_{x\to\infty} \frac{1}{2x} = \frac{1}{RBN} = 0$

$\lim_{x\to -\infty} \frac{2x-1}{4x^2-3} = \lim_{x\to -\infty} \frac{2x}{4x^2} = \lim_{x\to -\infty} \frac{1}{2x} = \frac{1}{-RBN} = 0$

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

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

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

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

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

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

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

$\lim_{x\to\infty} \frac{4x^7 - 6{,}000{,}000{,}000x^6 - 5}{8x^4 - 12x^6 + 40x^7 - 60{,}000}$ (degree = 7 / degree = 7)

$\lim_{x\to\infty} \frac{4x^7}{40x^7} = \frac{1}{10}$

b) $\lim_{x\to-\infty} e^x - 2x$

$e^{-\infty} - 2(-\infty)$

$\frac{1}{e^{\infty}} + 2\cdot\infty$

$0 + 2\cdot\infty = \infty$

c) $\lim_{x\to\infty} \frac{5+2^x}{2-2^x} = \frac{5+2^{\infty}}{2-2^{\infty}} = \frac{2^{\infty}}{-2^{\infty}} = \frac{1}{-1} = -1$

d) $\lim_{x\to-\infty} \frac{5+2^x}{2-2^x}$

$2^{-\infty} = \frac{1}{2^{\infty}} = \frac{1}{\text{BIG}} = 0$

$\lim_{x\to-\infty} \frac{5+2^x}{2-2^x} = \frac{5+0}{2-0} = \frac{5}{2} = 2\frac{1}{2}$

$\lim_{x\to 0} \frac{5x^4+8x^2}{3x^4-16x^2}$ is

$\lim_{x\to 0} \frac{x^2(5x^2+8)}{x^2(3x^2-16)} = \frac{5\cdot\text{SM}+8}{3\cdot\text{SM}-16} = \frac{0+8}{0-16} = \frac{8}{-16} = -\frac{1}{2}$