Limits and Vertical Asymptotes

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

Find:

$\lim_{x\to -3^-} \frac{-3x^2}{x^2-9}$ $\lim_{x\to -3^+} \frac{-3x^2}{x^2-9}$ $\lim_{x\to 3^-} \frac{-3x^2}{x^2-9}$ $\lim_{x\to 3^+} \frac{-3x^2}{x^2-9}$

I'm riding on this piece function approaching -3 from the right:

$\lim_{x\to -3^+} \frac{-3x^2}{x^2-9} = \infty$

I'm riding on this piece approaching 3 from the left:

$\lim_{x\to 3^-} \frac{-3x^2}{x^2-9} = \infty$

$x = 3$ vertical asymptote

I'm riding on this piece function approaching -3 so:

$\lim_{x\to -3^-} \frac{-3x^2}{x^2-9} = -\infty$

-3

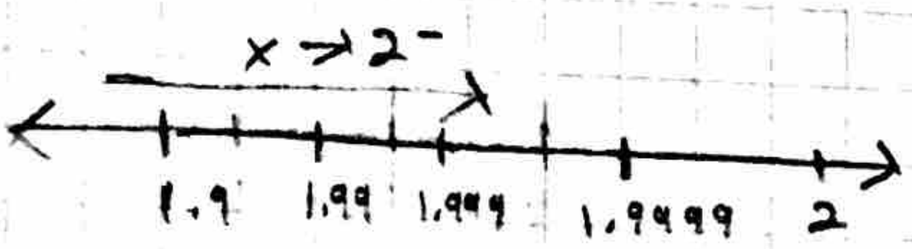
3

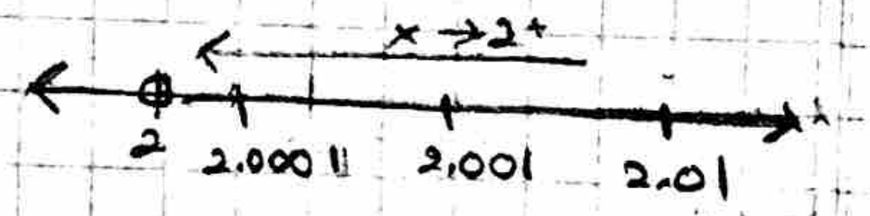
I'm riding on this piece as I approach 3 from the right.

$\lim_{x\to 3^+} \frac{-3x^2}{x^2-9} = -\infty$

I can approach -3 all the way from positive ∞. Riding ~~But it's~~ two pieces, But it is the last piece to ride that matters. This is my stupid way of understanding whats going on here.

$$\lim_{x \to 2} \frac{x^2 + 2x - 8}{x^2 - 4}$$





x	x^2+2x-8/x^2-4
1.9	1.51282
1.99	1.50125
1.999	1.50013
1.9999	1.50001

x	x^2+2x-8/x^2-4
2.01	1.49875
2.001	1.49988
2.0001	1.49999

$$\lim_{x \to 2} \frac{x^2+2x-8}{x^2-4} = 1.5$$

Asymptote Form

$$\frac{x}{0}$$

$$x^2 - 4 = 0$$
$$+4 \quad +4$$
$$\sqrt{x^2} = \pm\sqrt{4}$$
$$x = \pm 4$$

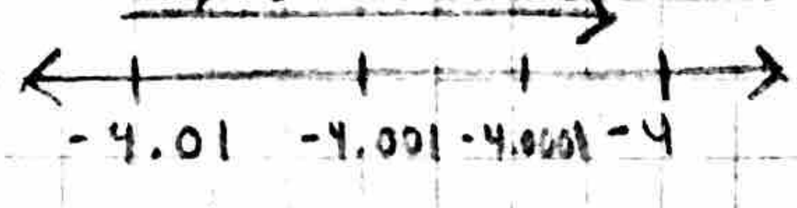
$$\frac{(4)^2 + 2(4) - 8}{(4)^2 - 4}$$
$$=$$
$$\frac{16 + 8 - 8}{16 - 4}$$
$$=$$
$$\frac{16}{12}$$
$$=$$
$$\frac{4}{3}$$

$$\frac{(-4)^2 + 2(-4) - 8}{(-4)^2 - 4}$$
$$=$$
$$\frac{16 - 8 - 8}{16 - 4}$$
$$=$$
$$\frac{16 - 16}{12}$$
$$=$$
$$\frac{0}{12}$$
$$=$$
$$0 \rightarrow \frac{0}{0}$$

No Asymptote at $x = 2$

43. $\lim_{x \to -4} \frac{x^2+6x+8}{x^2-16}$

$x \to -4$



x	x^2+6x+8 / x^2-16
-4.01	.250936
-4.001	.250094
-4.0001	.250009
.	

$\lim_{x \to -4} \frac{x^2+6x+8}{x^2-16} = .25$

$x^2 - 16 = 0$

$+16 \quad +16$

$\sqrt{x^2} = \pm\sqrt{16}$

$x = \pm 4$

$\frac{(4)^2+6(4)+8}{(4)^2-16}$

$=$

$\frac{16+10+8}{16-16}$

$=$

$\frac{34}{0}$ = undef

Vertical Asymptote at $x = 4$

$\frac{(-4)^2+6(-4)+8}{(-4)^2-16}$

$=$

$\frac{16-24+8}{16-16}$

$\frac{0}{0}$

no Vertical Asymptote at $x = -4$