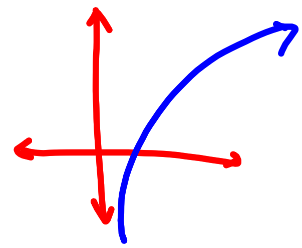
HW Review

29. $\lim\limits_{x\to 3^+} \ln(x^2-9) = -\infty$

$* \ln(f(x))$

$f(x) > 0$

$y = \ln x$



Let $x = 3.1$

$\ln(3.1^2 - 9)$

$= -.49$

$\ln(3.01^2 - 9)$

$= -2.8$

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29. $\lim\limits_{t\to 0}\left(\dfrac{1}{t\sqrt{1+t}} - \dfrac{1}{t}\cdot\dfrac{\sqrt{1+t}}{\sqrt{1+t}}\right) = \lim\limits_{t\to 0} \dfrac{1-\sqrt{1+t}}{t\sqrt{1+t}}$

$$\frac{1-\sqrt{1+t}}{t\sqrt{1+t}}$$

$$= \lim_{t\to 0} \frac{(1-\sqrt{1+t})(1+\sqrt{1+t})}{t\sqrt{1+t}\,(1+\sqrt{1+t})}$$

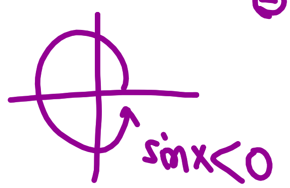
$$= \lim_{t\to 0} \frac{\overset{-1}{\cancel{\overset{-t}{\cancel{1 - (1+t)}}}}}{\cancel{t}\sqrt{1+t}\,(1+\sqrt{1+t})}$$

$$= \lim_{t\to 0} \frac{-1}{\sqrt{1+t}\,(1+\sqrt{1+t})} = \frac{-1}{2}$$

31. $\lim\limits_{x\to 2\pi^-} x \csc x$

$\csc x = \dfrac{1}{\sin x}$

$$\lim_{x\to 2\pi^-} \frac{\overset{+}{x}}{\underset{-}{\sin x}} = -\infty$$



$$\lim_{x\to 0} \frac{\sin x}{x} = 1$$

$$\lim_{x\to \infty} \frac{\sin x}{x} = 0$$

$$\lim_{x\to \frac{\pi}{2}} \frac{\sin x}{x} = \frac{1}{\frac{\pi}{2}} = \frac{2}{\pi}$$

$$\lim_{x\to 0} \frac{\sin ax}{bx} = \frac{a}{b}$$

$f(x) = \dfrac{3}{x}$

$f(0) =$ und.

$$\lim_{x\to 0^+} \frac{3}{x} = \infty$$

$$\lim_{x\to 0} \frac{3}{x^2} = \infty$$

$$\lim_{x\to\infty} \frac{ax^n + bx^{n-1} + \cdots}{kx^m + lx^{m-1} + \cdots}$$

① if $n > m$

limit approaches $\pm\infty$

③ if $n < m$

$\rightarrow 0$

② if $n = m$

$\rightarrow \frac{a}{k}$

* $\sqrt{x^n} = x^{\frac{n}{2}}$, $\sqrt{x^2} = |x|$

$$|x| = \begin{cases} x, & x \geq 0 \\ -x, & x < 0 \end{cases}$$

24. $\displaystyle\lim_{x\to-\infty} \frac{\sqrt{9x^6 - x}}{x^3 + 1}$