20) $\lim_{s \to 0} \left(\frac{\left(1/\sqrt{1+s}\right) - \frac{1}{1}\frac{\sqrt{1+s}}{\sqrt{1+s}}}{s} \right) = \frac{\frac{1-\sqrt{1+s}}{\sqrt{1+s}}}{s} = \frac{(1-\sqrt{1+s})}{s\sqrt{1+s}} \frac{(1+\sqrt{1+s})}{1+\sqrt{1+s}}$

$\Rightarrow \lim_{s \to 0} \left(\frac{1-(1+s)}{(s\sqrt{1+s})(1+\sqrt{1+s})} \right) = \frac{\cancel{1-1}-s}{(s\sqrt{1+s})(1+\sqrt{1+s})} = \frac{-\cancel{s}}{(\cancel{s}\sqrt{1+s})(1+\sqrt{1+s})} = \frac{-1}{(\sqrt{1+s})(1+\sqrt{1+s})}$

$\Rightarrow \lim_{s \to 0} \left(\frac{-1}{(\sqrt{1+s})(1+\sqrt{1+s})} \right) = \frac{-1}{\underset{1}{(\sqrt{1+0})}\underset{1+1}{(1+\sqrt{1+0})}} = \boxed{\frac{-1}{2}}$

2.1) $\lim_{x \to -5} \left(\frac{x^3+125}{x+5} = \frac{\cancel{(x+5)}(x^2-5x+25)}{\cancel{x+5}} \right)$ =

$\Rightarrow \lim_{x \to -5} x^2-5x+25 = (-5)^2-5(-5)+25 = \boxed{75}$

=

2b) $$\lim_{\Delta x \to 0}\left(\frac{\cos(\pi+\Delta x)+1}{\Delta x} = \frac{\cos\pi\cos\Delta x - \cancel{\sin\pi\sin\Delta x} + 1}{\Delta x}\right)$$

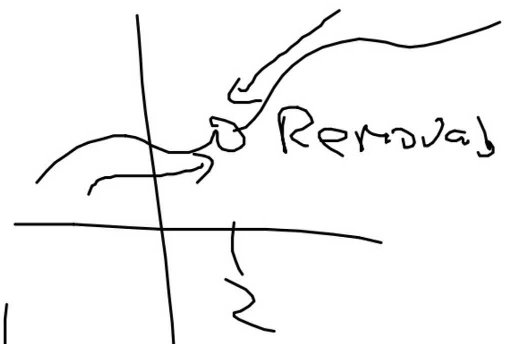
(Hint: $\cos(\theta+\phi) = \cos\theta\cos\phi - \sin\theta\sin\phi$)

$$\Rightarrow \lim_{\Delta x \to 0}\left(\frac{-\cos\Delta x + 1}{\Delta x} = \frac{1-\cos\Delta x}{\Delta x}\right) = \boxed{0}$$ ✓

37) $\lim_{x \to 2} f(x)$, where $f(x) = \begin{cases} (x-2)^2, & x \leq 2 \\ 2-x, & x > 2 \end{cases}$

$(2-2)^2 = 0$

$2-2 = 0$

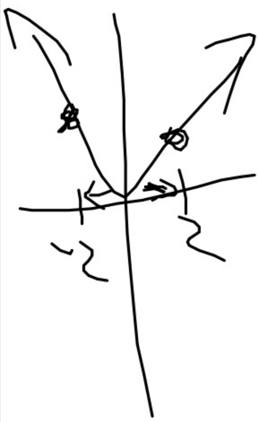


Removable.

Non remov.

57) Let $f(x) = \dfrac{x^2-4}{|x-2|}$. Find each limit. (If possible)

a). $\displaystyle\lim_{x\to 2^-}\left(\frac{x^2-4}{|x-2|}\right) = \frac{(x+2)\cancel{(x-2)}}{+\cancel{|x-2|}} = -4$



$$\frac{(x+2)\cancel{(x-2)}}{\cancel{x-2}}$$

63) $\lim_{x \to -2^{-}} \frac{\overset{+}{2x^2} \overset{-}{+x} \overset{+}{+1}}{x+2}$ $+8-2+1 \neq 0$

$-$

$-2.001+2$

$-2.0001+2$ (a) $x=2$ VA

∞ or $-\infty$

/

3) $\lim_{x \to 1^+} \left(f(x) = \left(\frac{\sqrt{2x+1} - \sqrt{3}}{(x-1)} \right) \cdot \frac{(\sqrt{2x+1} + \sqrt{3})}{(\sqrt{2x+1} + \sqrt{3})} = \frac{2x+1-3}{(x-1)(\sqrt{2x+1}+\sqrt{3})} \right)$

$$\Rightarrow \lim_{x \to 1^+} \left(\frac{2x-2}{(x-1)(\sqrt{2x+1}+\sqrt{3})} = \frac{2\cancel{(x-1)}}{\cancel{(x-1)}(\sqrt{2x+1}+\sqrt{3})} = \frac{2}{\sqrt{2x+1}+\sqrt{3}} \right)$$

$$= \frac{2}{\sqrt{2(1)+1}+\sqrt{3}}$$

$$= \frac{\cancel{2}}{\cancel{2}\sqrt{3}} = \frac{1}{\sqrt{3}}$$

$$= \frac{\sqrt{3}}{3}$$

$$19)\ \lim_{x\to 0}\left(\frac{\left(\frac{1}{x+1}\right)-1\frac{x+1}{x+1}}{x}=\frac{\frac{1-(x+1)}{x+1}}{x}=\frac{\frac{\cancel{1}-x\cancel{-1}}{x+1}}{x}\right)$$

$$\Rightarrow \lim_{x\to 0}\left(\frac{-\cancel{x}}{x+1}\cdot\frac{1}{\cancel{x}}=\frac{-1}{x+1}\right)=\frac{-1}{0+1}=\boxed{-1}$$

$$23)\ \lim_{x\to 0}\left(\frac{1-\cos x}{\sin x}\cdot\frac{1+\cos x}{1+\cos x}\right)=\frac{1-\cos^2 x}{\sin x(1+\cos x)}=\frac{\sin^{\cancel{2}} x}{\cancel{\sin x}(1+\cos x)}$$

$$\Rightarrow \lim_{x\to 0}\left(\frac{\sin x}{1+\cos x}\right)=\frac{\sin(0)}{1+\cos(0)}=\frac{0}{2}=\boxed{0}$$

39) $\lim_{t \to 1} h(t)$, where $h(t) = \begin{cases} t^3+1, & t<1 \\ \frac{1}{2}(t+1), & t \geq 1 \end{cases}$

$1^3+1 = 2$

$\frac{1}{2}(1+1) = 1$

DNE.

33. $S(t) = -4.9t^2 + 250$ $\quad t = \text{time (seconds)}$

$t=4$

$V = \text{velocity}$

$$V(t) = \lim_{t \to a}\left(\frac{S(a)-S(t)}{a-t} = \frac{-4.9a^2 \cancel{+250} - (-4.9t^2 \cancel{+250})}{a-t}\right)$$

$$\Rightarrow \lim_{t \to 4}\left(\frac{-4.9a^2 + 4.9t^2}{a-t}\right) = \lim_{t \to 4}\left(\frac{-4.9(4^2) + 4.9t^2}{4-t}\right)$$

$a=4$

$$\Rightarrow \lim_{t \to 4} \frac{-78.4 + 4.9t^2}{4-t} = \frac{4.9(-16 + t^2)}{4-t} = \frac{4.9(t+4)\cancel{(t-4)}}{\cancel{4-t}} = -4.9(4+4) = \boxed{-39.2}$$