Name: ____ Date: ___________
AP Calculus AB Ms. Loughran

Do Now:

1. $\lim_{\theta \to \frac{\pi}{2}} \left(\frac{\cos^2\theta}{(1-\sin\theta)} \cdot \frac{(1+\sin\theta)}{(1+\sin\theta)} \right)$ $\quad 1-\sin^2\theta$

OR $\lim_{\theta \to \frac{\pi}{2}} \frac{\overset{(1+\sin\theta)(\cancel{1-\sin\theta})}{1-\sin^2\theta}}{\cancel{1-\sin\theta}} = 2$

$\lim_{\theta \to \frac{\pi}{2}} \frac{\cancel{\cos^2\theta}(1+\sin\theta)}{\cancel{\cos^2\theta}} = 1+1=2$

2. $\lim_{x \to \frac{\pi}{4}} \frac{\sin x + \cos x}{\tan x}$ $= \frac{\frac{\sqrt{2}}{2}+\frac{\sqrt{2}}{2}}{1} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

From the AP Calc Limits Involving Trig sheet

u-substitution

12. $\lim_{x\to\infty} x(\sin\frac{1}{x})$

$u = \frac{1}{x}$ $\quad ux = 1$ $\quad x = \frac{1}{u}$

$\lim_{u\to 0^+} \frac{1}{u}\cdot \sin u$

$\lim_{u\to 0^+} \frac{\sin u}{u} = 1$

13. $\lim_{x\to 0} x(\sin\frac{1}{x})$

$u = \frac{1}{x}$

b/c as $x \to 0$ from the right $u \to \infty$
$x \to 0$ from the left $u \to -\infty$

$\lim_{u\to\infty} \frac{1}{u}\cdot \sin u$

$\lim_{u\to\infty} \frac{\sin u}{u} = 0$ or $\lim_{u\to -\infty} \frac{\sin u}{u} = 0$

19. $\lim_{x\to\infty} x^2\sin(\frac{1}{x})$

$u = \frac{1}{x}$ $\quad x \to \infty,$ $u \to 0^+$

$\lim_{u\to 0^+} \frac{1}{u^2} \sin u$

$\lim_{u\to 0^+} \frac{\sin u}{u^2}$

$\lim_{u\to 0^+} \left(\underbrace{\frac{\sin u}{u}}_{1} \cdot \underbrace{\frac{1}{u}}_{\infty}\right)$ $\quad \infty$

Homework 09-12

Name: ______________________________ Date: ____________

AP Calc: Trig Limits Practice Ms. Loughran

Find the limits.

0 2. $\lim_{x\to\infty} \sin\left(\frac{2}{x}\right) = 0$

think of what $\frac{2}{x}$ looks like as $x\to\infty$

$\frac{1}{2}$ 4. $\lim_{h\to 0} \frac{\sin h}{2h}$

∞ 6. $\lim_{\theta\to 0^+} \frac{\sin\theta}{\theta^2}$

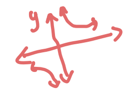
$\lim_{\theta\to 0^+} \left(\frac{\sin\theta}{\theta} \cdot \frac{1}{\theta} \right) = \infty$ ($1 \cdot \infty$)

$\frac{1}{3}$ 8. $\lim_{x\to 0} \frac{\sin^2 x}{3x^2}$

$\frac{6}{8}$ or $\frac{3}{4}$ 10. $\lim_{x\to 0} \frac{\sin 6x}{\sin 8x}$

0 12. $\lim_{\theta\to 0} \frac{\sin^2\theta}{\theta}$

$\lim_{\theta\to 0} \left(\frac{\sin\theta}{\theta} \cdot \sin\theta \right)$ ($1 \cdot 0$)



dne 14. $\lim_{h\to 0} \frac{\sin h}{1-\cos h} \cdot \frac{(1+\cos h)}{(1+\cos h)}$

$1-\cos^2 h$

$\lim_{h\to 0} \frac{\sin h(1+\cos h)}{\sin^2 h}$

$\lim_{h\to 0} \frac{1+\cos h}{\sin h}$ → $\frac{2}{h}$ * now approach it infinitely

behave like $\lim_{h\to 0} \frac{2}{h}$

dne

1 16. $\lim_{x\to 0} \frac{x}{\cos\left(\frac{1}{2}\pi - x\right)}$

$\cos\left(\frac{\pi}{2}-x\right) = \cos\frac{\pi}{2}\cos x + \sin\frac{\pi}{2}\sin x$ ($0 \cdot \cos x$)

$= 0 + 1\cdot\sin x$

$= \sin x$

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

1 18. $\lim_{t\to 0} \frac{t^2}{1-\cos^2 t}$

$\lim_{t\to 0} \frac{t^2}{\sin^2 t} = \lim_{t\to 0} \left(\frac{t}{\sin t} \cdot \frac{t}{\sin t} \right) = 1$ ($1 \cdot 1$)

-3 20. $\lim_{x\to 0} \frac{x^2 - 3\sin x}{x}$

$\frac{a}{b}$ 22. $\lim_{x\to 0} \frac{\tan ax}{\sin bx}$ $(a,b \neq 0)$

0 24. $\lim_{x\to 0^+} \frac{\sin x}{\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}}$

$\lim_{x\to 0^+} \frac{\sqrt{x}\sin x}{x}$

$\lim_{x\to 0^+} \left(\frac{\sin x}{x} \cdot \sqrt{x} \right) = 0$ ($1 \cdot 0$)

* 16. $\lim_{x\to 0} \dfrac{x}{\cos\left(\dfrac{1}{2}\pi - x\right)}$ $= \lim_{x\to 0} \dfrac{x}{\sin x} = 1$

$\cos(A-B) = \cos A \cos B + \sin A \sin B$

$\cos\left(\frac{\pi}{2} - x\right) = \cos\frac{\pi}{2}\cos x + \sin\frac{\pi}{2}\sin x$

$= 0 \cdot \cos x + 1(\sin x)$

$0 + \sin x$

$\sin x$