Name: _____ Date: _____

AP Calculus AB Ms. Loughran

Do Now:

Evaluate.

1. $\lim_{x\to 0}\frac{\sin x}{5x}$ $= \frac{1}{5}$

2. $\lim_{x\to 0}\frac{3-3\cos x}{x}$ $= \lim_{x\to 0}\left(3\cdot\frac{1-\cos x}{x}\right) = 0$

3. $\lim_{\theta\to 0}\frac{\cos\theta\tan\theta}{\theta}$ $= \lim_{\theta\to 0}\frac{\cos\theta\cdot\frac{\sin\theta}{\cos\theta}}{\theta} = \lim_{x\to 0}\frac{\sin\theta}{\theta} = 1$

or $\lim_{\theta\to 0}\left(\frac{\tan\theta}{\theta}\cdot\cos\theta\right) = 1$

4. $\lim_{x\to\frac{1}{2}} x\sec(\pi x)$ $= \frac{1}{2}\sec\left(\pi\cdot\frac{1}{2}\right) = \frac{1}{2}\,\text{dne} = \text{dne}$

Homework 09-14

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Do Now:

Evaluate each of the following.

9 1. $\lim_{x\to 0}\frac{1-\cos^2(3x)}{x^2}$ $= \lim_{x\to 0}\left(\frac{\sin(3x)}{x}\cdot\frac{\sin(3x)}{x}\right)$ ($\sin^2(3x)$)

$= 3\cdot 3 = 9$

0 2. $\lim_{\theta\to 0}\frac{\theta+2}{\cot\theta} = \lim_{\theta\to 0}\tan\theta(\theta+2)$

$= 0(2)$

$= 0$

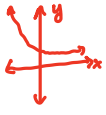
0 3. $\lim_{x\to\pi}\frac{\sqrt{x}}{\csc x} = \lim_{x\to\pi}\sqrt{x}\sin x$

$\sqrt{\pi}\cdot 0 = 0$

0 4. $\lim_{x\to\infty} e^{-x}\cos x$

$\lim_{x\to\infty} e^{-x}\cdot\lim_{x\to\infty}\cos x$

$0\cdot \text{dne} = 0$



−1 5. $\lim_{x\to 0}\frac{\cos(2x)-1}{2x^2}$ bounded

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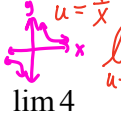
0 6. $\lim_{x\to 0}\frac{\sin(x^2)}{x}$ → on next page

0 7. $\lim_{x\to-\infty} x\left(1-\cos\left(\frac{1}{x}\right)\right)$



$\lim_{u\to 0^-}\frac{1}{u}(1-\cos u) = \lim_{u\to 0^-}\frac{1-\cos u}{u} = 0$

4 8. $\lim_{x\to 3} 4$

* the limit of a constant is the constant

5. $\lim_{x\to 0}\dfrac{\cos(2x)-1}{2x^2}$

$\cos^2(2x)-1$

$\lim_{x\to 0}\left(\dfrac{\cos(2x)-1}{2x^2}\cdot\dfrac{(\cos(2x)+1)}{(\cos(2x)+1)}\right)$

$\lim_{x\to 0}\dfrac{-\sin^2(2x)}{2x^2(\cos(2x)+1)}$

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

$-\frac{1}{2}\cdot 2\cdot 2\cdot\frac{1}{2}=-1$

~~$1-2\sin^2x=1$~~

5. $\lim_{x\to 0}\dfrac{\cos(2x)-1}{2x^2}$

$\lim_{x\to 0}\dfrac{-2\sin^2x}{2x^2}$

$\lim_{x\to 0}\dfrac{-\sin^2x}{x^2}$

$\lim_{x\to 0}\left(-1\cdot\dfrac{\sin x}{x}\cdot\dfrac{\sin x}{x}\right)$

$-1\cdot 1\cdot 1=-1$

6. $\lim_{x\to 0}\dfrac{\sin(x^2)}{x}=0$

$u=x^2$

$x=\pm\sqrt{u}$

$\lim_{u\to 0}\dfrac{\sin u}{\pm\sqrt{u}}$

$\lim_{u\to 0}\dfrac{\sin u}{\sqrt{u}}\cdot\dfrac{\sqrt{u}}{\sqrt{u}}=\lim_{u\to 0}\dfrac{\sqrt{u}\sin u}{u}$

$\sqrt{0}\cdot 1$

0

$\lim_{u\to 0}\dfrac{\sin u}{-\sqrt{u}}=0$