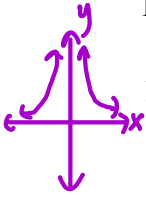


Name: _____
 AP Calculus AB

Date: _____
 Ms. Loughran

Do Now:

Evaluate each of the following.



1. $\lim_{x \rightarrow 0} x^2 \cos\left(\frac{1}{x^2}\right)$

$u = \frac{1}{x^2}$
 $\lim_{u \rightarrow \infty} \frac{1}{u} \cos u = \lim_{x \rightarrow \infty} \frac{\cos u}{u} = 0$

2. $\lim_{\theta \rightarrow 0} \frac{\sin(\cos \theta)}{\sec \theta}$

$\lim_{\theta \rightarrow 0} \sin(\cos \theta) \cos \theta = \sin 1$ plug or in $\frac{\sin 1}{1} = \sin 1$

3. $\lim_{x \rightarrow 0} \frac{x \csc x + 1}{x \csc x}$

$= \lim_{x \rightarrow 0} \left(\frac{x \csc x}{x \csc x} + \frac{1}{x \csc x} \right) \rightarrow x \cdot \frac{1}{\sin x}$
 $= \lim_{x \rightarrow 0} \left(1 + \frac{\sin x}{x} \right) = 1 + 1 = 2$
transformation of $\frac{\sin x}{x}$ moves it right and

4. $\lim_{x \rightarrow 1} \frac{\sin(x-1)}{x^2 + x - 2}$

$= \lim_{x \rightarrow 1} \left(\frac{\sin(x-1)}{x-1} \cdot \frac{1}{x+2} \right) = \frac{1}{3}$

OR $u = x-1$
 $\lim_{u \rightarrow 0} \frac{\sin u}{u} \cdot \lim_{x \rightarrow 1} \frac{1}{x+2} = \frac{1}{3}$

5. $\lim_{x \rightarrow 0} \tan\left(\frac{1-\cos x}{x}\right)$

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

6. $\lim_{x \rightarrow 5} 4e = 4e$
 ↑ constant

$= \tan \lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \cdot \frac{\sin x}{1+\cos x} \right)$
 $\tan 0 = 0$

AP CALCULUS AB



Go back and wrap up this sheet from Tuesday...

AP Calc: Limits involving Trig

Evaluate each of the following.

1. $\lim_{x \rightarrow \frac{\pi}{4}} \sin 2x = \sin\left(\frac{2\pi}{4}\right) = 1$

2. $\lim_{x \rightarrow \frac{\pi}{2}} \tan x$ dne

3. $\lim_{x \rightarrow 0} \frac{\sin 3x}{x} = 3$

4. $\lim_{x \rightarrow 0} \frac{\tan 5x}{3x} = \frac{5}{3}$

5. $\lim_{x \rightarrow 0} \frac{\sin x \cos x}{x} = \lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \cdot \cos x \right)$
 $1 \cdot 1 = 1$

6. $\lim_{x \rightarrow 0} \frac{\sin^2 x}{x}$

7. $\lim_{x \rightarrow 0} \frac{\cos x}{x^2}$

8. $\lim_{x \rightarrow \infty} \frac{\tan x}{x}$

9. $\lim_{x \rightarrow 0} \frac{3 \sin 4x}{\sin 3x} = 3\left(\frac{4}{3}\right) = 4$

10. $\lim_{x \rightarrow 0} \frac{\sin x}{2x^2 - x}$

11. $\lim_{x \rightarrow 0} \frac{x + \sin x}{x} = \lim_{x \rightarrow 0} \left(\frac{x}{x} + \frac{\sin x}{x} \right) = \lim_{x \rightarrow 0} \left(1 + \frac{\sin x}{x} \right) = 1 + 1 = 2$

12. $\lim_{x \rightarrow \infty} x \left(\sin \frac{1}{x} \right)$

13. $\lim_{x \rightarrow 0} x \left(\sin \frac{1}{x} \right)$

14. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x} = 0$

15. $\lim_{x \rightarrow 0} \frac{\sin x}{x^2}$

16. $\lim_{x \rightarrow 0} \frac{\sin x}{x^3}$

17. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x^2}$

18. $\lim_{x \rightarrow 0} \frac{x}{\cos x}$

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

20. $\lim_{x \rightarrow 0} \frac{\sin x}{x(x+2)}$

21. $\lim_{x \rightarrow \infty} \frac{5x + \sin x}{x} = \lim_{x \rightarrow \infty} \left(\frac{5x}{x} + \frac{\sin x}{x} \right) =$
 $\lim_{x \rightarrow \infty} \left(5 + \frac{\sin x}{x} \right) = 5 + 0 = 5$

Homework 09-13

Name: _____
AP Calc: Trig Limits Practice

Date: _____
Ms. Loughran

Find the limits.

1. $\lim_{x \rightarrow \infty} \cos\left(\frac{1}{x}\right) = 1$
 $u = \frac{1}{x}$
 $\lim_{u \rightarrow 0^+} \cos u = 1$

13. $\lim_{h \rightarrow 0} \frac{h}{\tan h} = 1$

3. $\lim_{x \rightarrow \infty} \sin\left(\frac{\pi x}{2-3x}\right) = -\frac{\sqrt{3}}{2}$
 $\sin \lim_{x \rightarrow \infty} \left(\frac{\pi x}{2-3x}\right)$
 $\sin\left(-\frac{\pi}{3}\right) = -\frac{\sqrt{3}}{2}$

15. $\lim_{\theta \rightarrow 0} \left(\frac{\theta^2}{1-\cos\theta} \cdot \frac{(1+\cos\theta)}{(1+\cos\theta)} \right)$
 $\lim_{\theta \rightarrow 0} \frac{\theta^2(1+\cos\theta)}{\sin^2\theta} = \lim_{\theta \rightarrow 0} \left(\frac{\theta^2}{\sin^2\theta} \cdot (1+\cos\theta) \right) = 2$
 $\frac{\theta}{\sin\theta} \cdot \frac{\theta}{\sin\theta} \cdot (1+\cos\theta)$

5. $\lim_{\theta \rightarrow 0} \frac{\sin 3\theta}{\theta} = 0$
 # plug in

7. $\lim_{x \rightarrow 0^-} \frac{\sin x}{|x|} = \lim_{x \rightarrow 0^-} \left(\frac{\sin x}{x} \cdot -1 \right) = -1$
 $\lim_{x \rightarrow 0^-} \frac{\sin x}{x} = 1$

19. $\lim_{x \rightarrow 0^+} \cos\left(\frac{1}{x}\right) = \text{dne}$
 $u = \frac{1}{x}$
 $\lim_{u \rightarrow \infty} \cos u = \text{dne}$
 As $x \rightarrow 0^+$, $u \rightarrow \infty$

$\frac{\sin x}{|x|} = \begin{cases} \frac{\sin x}{x} & x > 0 \\ \frac{\sin x}{-x} & x < 0 \end{cases}$

9. $\lim_{x \rightarrow 0} \left(\frac{\sin x}{5\sqrt{x}} \cdot \frac{\sqrt{x}}{\sqrt{x}} \right) = 0$
 $\lim_{x \rightarrow 0^+} \frac{\sqrt{x} \sin x}{5x} = \lim_{x \rightarrow 0^+} \left(\frac{\sqrt{x}}{5} \cdot \frac{\sin x}{x} \right) = 0$
 or $\lim_{x \rightarrow 0^+} \left(\frac{\sin x}{5x} \cdot \sqrt{x} \right) = 0$

11. $\lim_{x \rightarrow 0} \frac{\tan 7x}{\sin 3x} = \frac{7}{3}$
 dne

21. $\lim_{x \rightarrow 0} \frac{2x + \sin x}{x}$

23. $\lim_{\theta \rightarrow 0} \frac{\sin 2\theta}{\theta^2}$

$\lim_{\theta \rightarrow 0} \left(\frac{\sin 2\theta}{\theta} \cdot \frac{1}{\theta} \right)$
 $2 \cdot \text{dne} = \text{dne}$

