Name: ______________________________ Date: _________

AP Calculus AB Ms. Loughran

Do Now:

Evaluate each of the following.

1. $\lim\limits_{x \to 9} \dfrac{\cancel{3-\sqrt{x}}}{9-x}$ $= \dfrac{1}{6}$

$(\cancel{3-\sqrt{x}})(3+\sqrt{x})$

2. $\lim\limits_{x \to 25} \dfrac{\overset{-1}{\cancel{5-\sqrt{x}}}}{x-25}$ $= -\dfrac{1}{10}$

$(\sqrt{x}+5)(\cancel{\sqrt{x}-5})$

3. $\lim\limits_{x \to 2^-} \dfrac{3^{+}}{\underset{-}{x-2}}$ $-\infty$

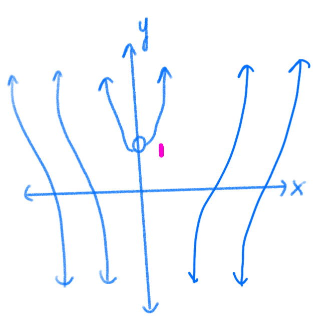
1.9	2
$-\infty$	VA

4. $\lim\limits_{x \to 0} \dfrac{1-\cos(4x)}{x}$

5. $\lim\limits_{x \to -\infty} \dfrac{\sqrt{3x^2+4}}{x+1}$ $= -\sqrt{3}$

Add to the "Important Trig Stuff" sheet

$y = \dfrac{\tan x}{x}$



$\lim\limits_{x \to 0^+} \dfrac{\tan x}{x} = 1$ $\lim\limits_{x \to \pm\infty} \dfrac{\tan x}{x}$ dne

$\lim\limits_{x \to 0^-} \dfrac{\tan x}{x} = 1$

$\lim\limits_{x \to 0} \dfrac{\tan x}{x} = 1$

When "splitting" trig limits, never split into:

1. $0 \cdot \pm\infty$
2. dne · dne
3. $0 \cdot$ dne

special exception to #3
if $0 \cdot \underset{\text{bounded}}{\text{dne}} = 0$

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

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

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

dne · 0 = 0
(bounded b/w −1 and 1)

Do Now from yesterday #2:

* If you split to a limit that dne. a limit the does exist → dne

2. Evaluate: $\lim\limits_{x\to\infty} \dfrac{x\sin x + 2\sin x}{2x^2}$

$$\lim_{x\to\infty}\left(\frac{\cancel{x}\sin x}{2x^{\cancel{2}}} + \frac{\cancel{2}\sin x}{\cancel{2}x^2}\right)$$

$$\lim_{x\to\infty}\left(\frac{1}{2}\cdot\frac{\sin x}{x} + \frac{1}{x}\cdot\frac{\sin x}{x}\right) = 0 + 0 = 0$$

Do Now from today #4:

4. $\lim\limits_{x\to 0}\left(\dfrac{1-\cos(4x)}{x}\right)\cdot\left(\dfrac{(1+\cos(4x))}{(1+\cos(4x))}\right)$ $1-\cos^2(4x)$

$$\lim_{x\to 0}\left(\frac{\sin^2(4x)}{x(1+\cos(4x))}\right)$$

$$\lim_{x\to 0}\left(\frac{\sin 4x}{x}\cdot\frac{\sin 4x}{(1+\cos 4x)}\right)$$

$$4 \cdot \frac{0}{2} = 4 \cdot 0 = 0$$

AP Calc: Limits involving Trig

Evaluate each of the following.

1. $\lim\limits_{x\to\frac{\pi}{4}} \sin 2x$ $= \sin\left(\frac{2\pi}{4}\right) = 1$

2. $\lim\limits_{x\to\frac{\pi}{2}} \tan x$ dne

3. $\lim\limits_{x\to 0} \frac{\sin 3x}{x}$ $=3$

4. $\lim\limits_{x\to 0} \frac{\tan 5x}{3x}$ $= \frac{5}{3}$

5. $\lim\limits_{x\to 0} \frac{\sin x \cos x}{x}$ $= \lim\limits_{x\to 0} \left(\frac{\sin x}{x} \cdot \cos x\right)$

   $1 \cdot 1 = 1$

6. $\lim\limits_{x\to 0} \frac{\sin^2 x}{x}$

7. $\lim\limits_{x\to 0} \frac{\cos x}{x^2}$

8. $\lim\limits_{x\to \infty} \frac{\tan x}{x}$

9. $\lim\limits_{x\to 0} \frac{3\sin 4x}{\sin 3x}$ $= 3\left(\frac{4}{3}\right) = 4$

10. $\lim\limits_{x\to 0} \frac{\sin x}{2x^2 - x}$

11. $\lim\limits_{x\to 0} \frac{x + \sin x}{x}$ $= \lim\limits_{x\to 0} \left(\frac{x}{x} + \frac{\sin x}{x}\right) = \lim\limits_{x\to 0} \left(1 + \frac{\sin x}{x}\right) = 1 + 1 = 2$

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

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

14. $\lim\limits_{x\to 0} \frac{1-\cos x}{x}$

15. $\lim\limits_{x\to 0} \frac{\sin x}{x^2}$

16. $\lim\limits_{x\to 0} \frac{\sin x}{x^3}$

17. $\lim\limits_{x\to 0} \frac{1-\cos x}{x^2}$

18. $\lim\limits_{x\to 0} \frac{x}{\cos x}$

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

20. $\lim\limits_{x\to 0} \frac{\sin x}{x(x+2)}$

21. $\lim\limits_{x\to \infty} \frac{5x + \sin x}{x}$ $= \lim\limits_{x\to \infty} \left(\frac{5x}{x} + \frac{\sin x}{x}\right) =$

    $\lim\limits_{x\to \infty} \left(5 + \frac{\sin x}{x}\right) = 5 + 0 = 5$

Homework 09-11

Name:______________________________ Date:__________

AP Calc: More Limits Ms. Loughran

1. $\lim_{x\to -2}\frac{x^3+8}{x+2}=$ $\lim_{x\to -2}\frac{\cancel{(x+2)}(x^2-2x+4)}{\cancel{x+2}} = 4+4+4 = 12$

2. $\lim_{x\to 2}\frac{1-4x^{-1}+4x^{-2}}{1+x^{-1}-6x^{-2}}=$ $\lim_{x\to 2}\left(\frac{\left(1-\frac{4}{x}+\frac{4}{x^2}\right)x^2}{\left(1+\frac{1}{x}-\frac{6}{x^2}\right)x^2}\right) = \lim_{x\to 2}\frac{x^2-4x+4}{x^2+x-6}$ $= \lim_{x\to 2}\frac{\cancel{x-2}}{x+3} = 0$

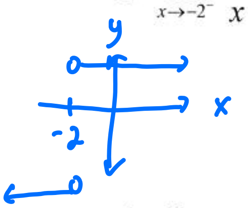
$(x-2)^{\cancel{2}}$

$(x+3)\cancel{(x-2)}$

3. $\lim_{x\to -2^-}\frac{|x+2|}{x+2}=$ -1 or plug in

-2.1

$\frac{+.1}{-.1} = -1$



4. $\lim_{x\to 1}\cos\left(\frac{x^2-1}{\cancel{x}-1}\right)=$ $\cancel{(x-1)}(x+1)$ $\lim_{x\to 1}\cos(x+1) = \cos 2$

5. $\lim_{x\to\infty}\frac{\sqrt{7x^2-2}}{x+7}=$ $\sqrt{7}$

6. $\lim_{x\to -b}\frac{x^2+bx}{\sqrt{x^2+2bx+b^2}}=$ $\lim_{x\to -b}\frac{x(x+b)}{|(x+b)|}$ dne

$\sqrt{(x+b)^2}$

$$\frac{x(x+b)}{|(x+b)|} = \begin{cases} \frac{x\cancel{(x+b)}}{\cancel{x+b}} = x \\ \frac{x\cancel{(x+b)}}{-\cancel{(x+b)}} = -x \end{cases}$$