Name: ______________________________ Date: _________

AP Calculus AB Ms. Loughran

Do Now:

1. Given: $g(t)=\begin{cases} t^2 & , t\ge 0 \\ t-2 & , t<0 \end{cases}$

Find: (a) $\lim_{t\to 0^-} g(t)$ $= -2$

(b) $\lim_{t\to 0^+} g(t)$ $= 0^2 = 0$

(c) $\lim_{t\to 0} g(t)$ dne

* 2. Evaluate: $\lim_{x\to\infty}\frac{x\sin x+2\sin x}{2x^2}$

3. Evaluate: $\lim_{x\to+\infty}\frac{1}{x}$ $= 0$

4. Evaluate: $\lim_{x\to 0}\left(\frac{\overset{x+\cancel{4}-\cancel{4}}{\sqrt{x+4}-2}}{x}\frac{(\sqrt{x+4}+2)}{(\sqrt{x+4}+2)}\right) = \lim_{x\to 0}\frac{\overset{1}{\cancel{x}}}{\cancel{x}(\sqrt{x+4}+2)} = \frac{1}{4}$

5. Evaluate: $\lim_{x\to-\infty}\frac{\overset{+}{\sqrt{5x^2-2}}}{\underset{-}{x+3}}$ $= -\frac{\sqrt{5}}{1} = \sqrt{5}$

* check the sign when approaching $-\infty$ and there is a radical involved

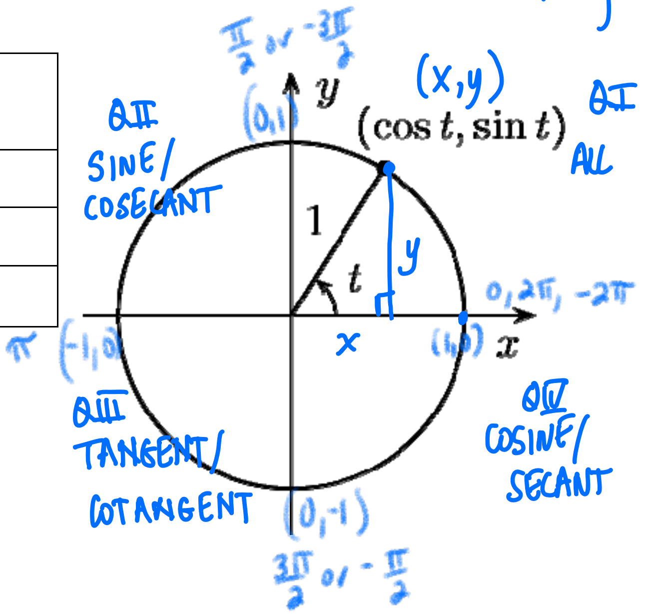
Name:_______________________________ Date:___________

AP Calc: Important Trig Stuff Ms. Loughran

"ALL STUDENTS TAKE CALCULUS"

Unit Circle: $x^2+y^2=1$

θ	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$
Sin θ	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$
Cos θ	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$
Tan θ	$\sqrt{3}/3$	1	$\sqrt{3}$



Quotient Identies:

$\tan\theta = \frac{\sin\theta}{\cos\theta}, \quad \cos\theta \neq 0$

$\cot\theta = \frac{\cos\theta}{\sin\theta}, \quad \sin\theta \neq 0$

Reciprocal Trig Functions:

$\csc\theta = \frac{1}{\sin\theta}, \quad \sin\theta \neq 0$

$\sec\theta = \frac{1}{\cos\theta}, \quad \cos\theta \neq 0$

$\cot\theta = \frac{1}{\tan\theta}, \quad \tan\theta \neq 0$

Pythagorean Identities:

$*\ \cos^2\theta + \sin^2\theta = 1\ *$

$1 + \tan^2\theta = \sec^2\theta$

$\cot^2\theta + 1 = \csc^2\theta$

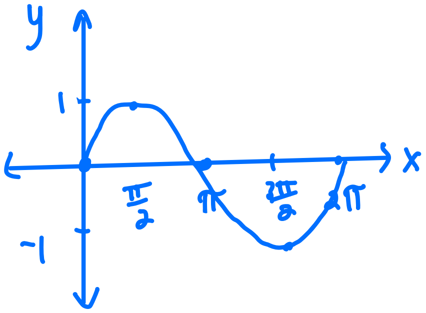
Double Angle Formulas:

$*\ \sin 2\theta = 2\sin\theta\cos\theta\ *$

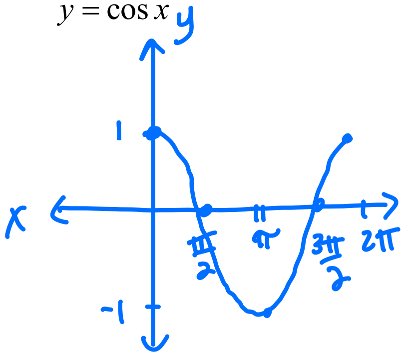
$$\cos 2\theta = \begin{cases} 2\cos^2\theta - 1 \\ 1 - 2\sin^2\theta \\ \cos^2\theta - \sin^2\theta \end{cases}$$

Graphs one cycle of each

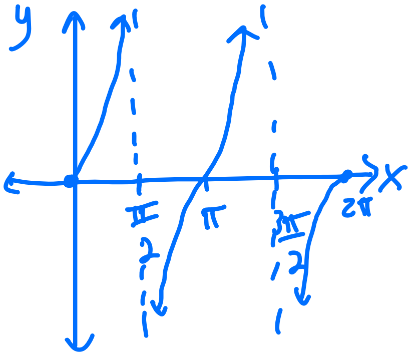
$y = \sin x$



$y = \cos x$

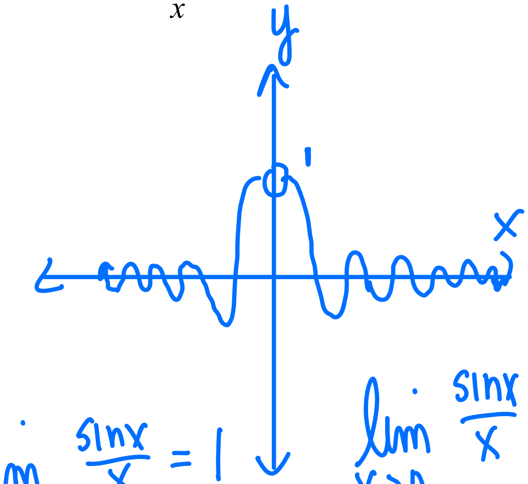


$y = \tan x$

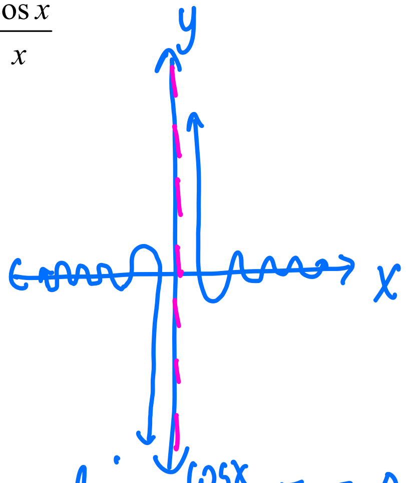


More Graphs

$y = \frac{\sin x}{x}$



$y = \frac{\cos x}{x}$



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

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

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

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

$\lim_{x \to \pm\infty} \frac{\sin x}{x} = 0$

$\lim_{x \to 0^-} \frac{\cos x}{x} = -\infty$

$\lim_{x \to 0^+} \frac{\cos x}{x} = \infty$

$\lim_{x \to 0} \frac{\cos x}{x}$ dne

$\lim_{x \to \pm\infty} \frac{\cos x}{x} = 0$

Summary of Trig Limits:

$\lim_{x \to 0} \frac{\sin kx}{x} = k$

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

$\lim_{x \to 0} \frac{\sin kx}{\sin mx} = \frac{k}{m}$

Remember that the above would also apply when using tan instead of sin.

$\lim_{x \to 0} \frac{\cos kx}{x}$ dne

$\lim_{x \to 0} \frac{\sin 3x}{\tan 2x} = \frac{3}{2}$

Homework 09-08

Name ______________________

Limits Review B

Directions: Find the limit (if it exists).

17 1. $\lim_{x\to 2}(3x^2+5)$

3 2. $\lim_{x\to 4}\frac{x^2-5x+4}{x-4}$

0 3. $\lim_{x\to -1}\frac{\overset{1-3+2}{x^2+3x+2}}{\underset{2}{x^2+1}} = 0$

plug in

1 4. $\lim_{x\to 1}\frac{x^2-x-2}{x-3}$ plug in

-2 6. $\lim_{x\to 1}\left(\frac{1-\sqrt{2x^2-1}}{x-1}\right)\cdot\left(\frac{1+\sqrt{2x^2-1}}{1+\sqrt{2x^2-1}}\right)$

$2(1-x^2)$
$2-2x^2$
$1-2x^2+1$
$1-(2x^2-1)$

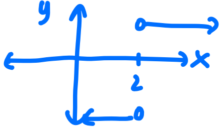
$\lim_{x\to 1}\frac{2(\cancel{1-x})(1+x)}{\cancel{(x-1)}(1+\sqrt{2x^2-1})} = \; = \frac{-4}{2} = -2$

-12 5. $\lim_{x\to -9}\frac{x^2+6x-27}{x+9}$

$\frac{1}{4}$ 7. $\lim_{x\to 2}\frac{x-2}{x^2-4}$

dne 8. $\lim_{x\to 2}\frac{x-2}{|x-2|}$

1.9	2.1
$\frac{-.1}{.1} = -1$	$\frac{.1}{.1} = 1$



$\frac{1}{7}$ 9. $\lim_{x\to 3}\frac{x+2}{x^3+8}$

3 10. $\lim_{x\to 1}\frac{x^2+x-2}{x-1}$

7 11. $\lim_{x\to 5}\frac{x^2-3x-10}{x-5}$

-1 12. $\lim_{t\to\infty}\frac{1}{2t}-\frac{t}{t+1} = \lim_{t\to\infty}\frac{1}{2t} - \lim_{t\to\infty}\frac{t}{t+1} = 0-1 = -1$

$\frac{1}{4}$ 13. $\lim_{x\to 0}\frac{\sqrt{x+4}-2}{x}$ * Do Now #4

-1 14. $\lim_{x\to\infty}\frac{3x+5}{4-3x} = \frac{3}{-3} = -1$

$\frac{1}{6}$ 15. $\lim_{x\to 0}\frac{\sqrt{x+9}-3}{x}$

$\frac{1}{3}$ 16. $\lim_{x\to\infty}\frac{x^2+2x}{3x^2-6x+1}$

0 17. $\lim_{x\to 3}\sqrt{9-x^2}$

12 18. $\lim_{x\to -2}\frac{x^3+8}{x+2}$

19. $\lim_{x\to\infty}\frac{2x}{(x+2)^2} = 0$

* when approaching ± ∞ if the degree of the numerator < the degree of the den. the limit =0

20. $\lim_{x\to 2^+}\frac{\overset{+}{x}}{\sqrt{x^2-4}}$

	2	2.1
	VA	+∞

if $\lim_{x\to 2^-}\frac{\overset{+}{x}}{\sqrt{x^2-4}}$

1.9	2
	VA

dne

21. $\lim_{x\to\infty}\frac{4+x}{3}$ +∞

* When approaching ± ∞ if the degree of num > the degree of den., then the limit ± ∞, you have to plug in to figure out if it is + or −

$\frac{1}{27}$ 22. $\lim_{x\to 3}\frac{\cancel{x-3}}{x^3-27} = \frac{1}{27}$

$(\cancel{x-3})(x^2+3x+9)$

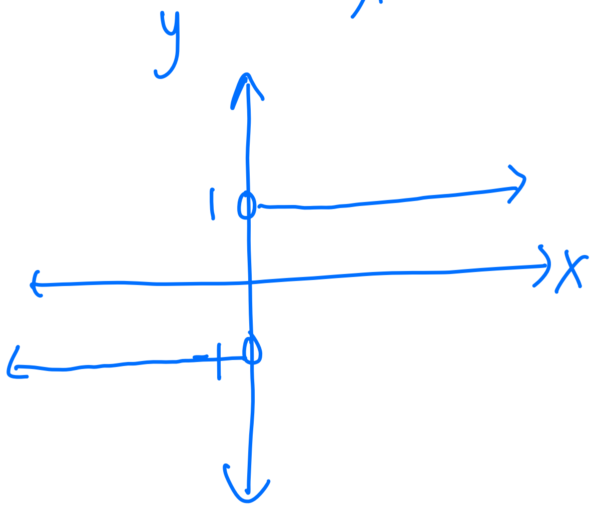
23. $\lim_{x\to\infty}\frac{3x+2}{x+1} = 3$

* when approaching ± ∞ if the degree of num = the degree of den., then the limit is the ratio of the leading coefficiants

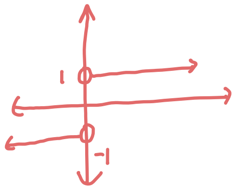
∞ 24. $\lim_{x\to\infty}\frac{4x^3-5x^2-1}{(x+2)^2}$

0 25. $\lim_{x\to 3}\frac{x-3}{\sqrt{x^2-9}}$

$$f(x) = \frac{|x|}{x} = \begin{cases} \frac{x}{x} = 1 & x > 0 \\ \frac{-x}{x} = -1 & x < 0 \end{cases}$$



$$f(x)=\frac{|x|}{x}=\begin{cases}\frac{x}{x}=1 & x>0\\ \frac{-x}{x}=-1 & x<0\end{cases}$$



8. $\lim_{x\to2}\frac{\overset{-.1}{x-2}}{\underset{.1}{|x-2|}}$ dne

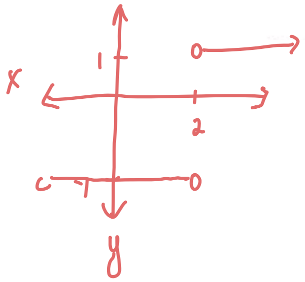
table method

1.9	2	2.1
-1	↑ hole	1

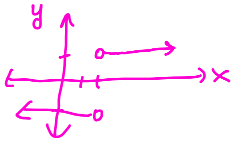
$\frac{x}{|x|}$

↑ transformation

8. $\lim_{x\to2}\frac{x-2}{|x-2|}$ dne



$$\frac{x-2}{|x-2|}=\begin{cases}\frac{x-2}{x-2}=1 & x-2>0,\ x>2\\ \frac{\cancel{x-2}}{-(\cancel{x-2})}=-1 & x<2\end{cases}$$



$2-2x^2$

$1-2x^2+1$

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

6. $\lim_{x\to1}\frac{(1-\sqrt{2x^2-1})}{x-1}\cdot\frac{(1+\sqrt{2x^2-1})}{(1+\sqrt{2x^2-1})}$

$(x-1)(1+\sqrt{2x^2-1})$

$$\lim_{x\to1}\frac{2(\overset{-1}{\cancel{1-x}})(1+x)}{\cancel{(x-1)}(1+\sqrt{2x^2-1})}=\frac{-4}{2}$$

$=-2$