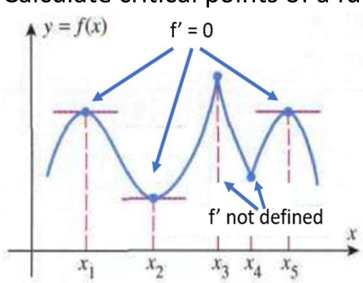
Calculus I Students,

Test 3 will be Thursday and April 9/10. You will take it on-line using MyMathLab. You must complete it in one session where you will have a total of two hours. To be prepared, you should have done or should do the following:

1. Watched all the videos on Chapter 4. http://telstarbob.net/bbrown/Math1540_daily_sch_Spring_2020-Revised.htm
2. Completed all the homework for Chapter 4.
3. Work the practice test by yourself. http://telstarbob.net/bbrown/Math1540OL/CalculusITest3Practice.pdf
4. Watch Practice test 3 video if you need help on any problem. https://www.youtube.com/watch?v=cy92PtEIsYU&feature=youtu.be
5. Ask me any questions or even request a Zoom Video Tutoring Session if you need additional help.
6. Calculate critical points of a function (f' = 0, or f' is not defined)



7. For a function $y = f(x)$, determine intervals in which the function is increasing (y' > 0) or decreasing (y' < 0). Solve y' = 0 to determine the intervals to consider.
8. Be able to calculate any absolute max/min or relative max/min of a function. **<u>Understand that, if the function is defined over a closed interval [a, b], you must evaluate the function at the end points as well as the critical points</u>**.
9. Calculate x = c in the Mean Value Theorem that satisfies $f'(c) = \frac{f(b)-f(a)}{b-a}$
10. Define intervals on which a function is concave up (f" > 0) or concave down (f" < 0).
11. Use l'Hopital's Rule to find limits. You may have to rewrite so that you have $\frac{0}{0}$ or $\frac{\infty}{\infty}$.
12. Solve max or min applications problems.
13. Calculate antiderivatives.
14. Solve initial value problems given y' or y" or position s' or s" and determine y or s as required. You solve by finding the antiderivative, adding a constant each time you integrate, and solve for the constants by using the initial values or values given at a point.

All of these ideas are illustrated in the Practice Test.

On the test, you may have this study guide as well as the derivative and anti-derivative tables at the end of this note.

Good luck,

Dr. Brown

Differentiation Rules

$$\frac{d}{dx}x^n = nx^{n-1}$$

$$\frac{d}{dx}\ln x = \frac{1}{x}$$

$$\frac{d}{dx}\sin x = \cos x$$

$$\frac{d}{dx}\cos x = -\sin x$$

$$\frac{d}{dx}\tan x = \sec^2 x$$

$$\frac{d}{dx}\csc x = -\csc x\ \cot x$$

$$\frac{d}{dx}\sec x = \sec x \tan x$$

$$\frac{d}{dx}\cot x = -\csc^2 x$$

$$\frac{d}{dx}e^x = e^x$$

$$\frac{d}{dx}a^x = (\ln a)a^x$$

$$\frac{d}{dx}\sin^{-1} x = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\cos^{-1} x = \frac{-1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx}\tan^{-1} x = \frac{1}{1+x^2}$$

$$\frac{d}{dx}\cot^{-1} x = \frac{-1}{1+x^2}$$

$$\frac{d}{dx}\sec^{-1} x = \frac{1}{x\sqrt{x^2-1}}$$

$$\frac{d}{dx}\csc^{-1} x = \frac{-1}{x\sqrt{x^2-1}}$$

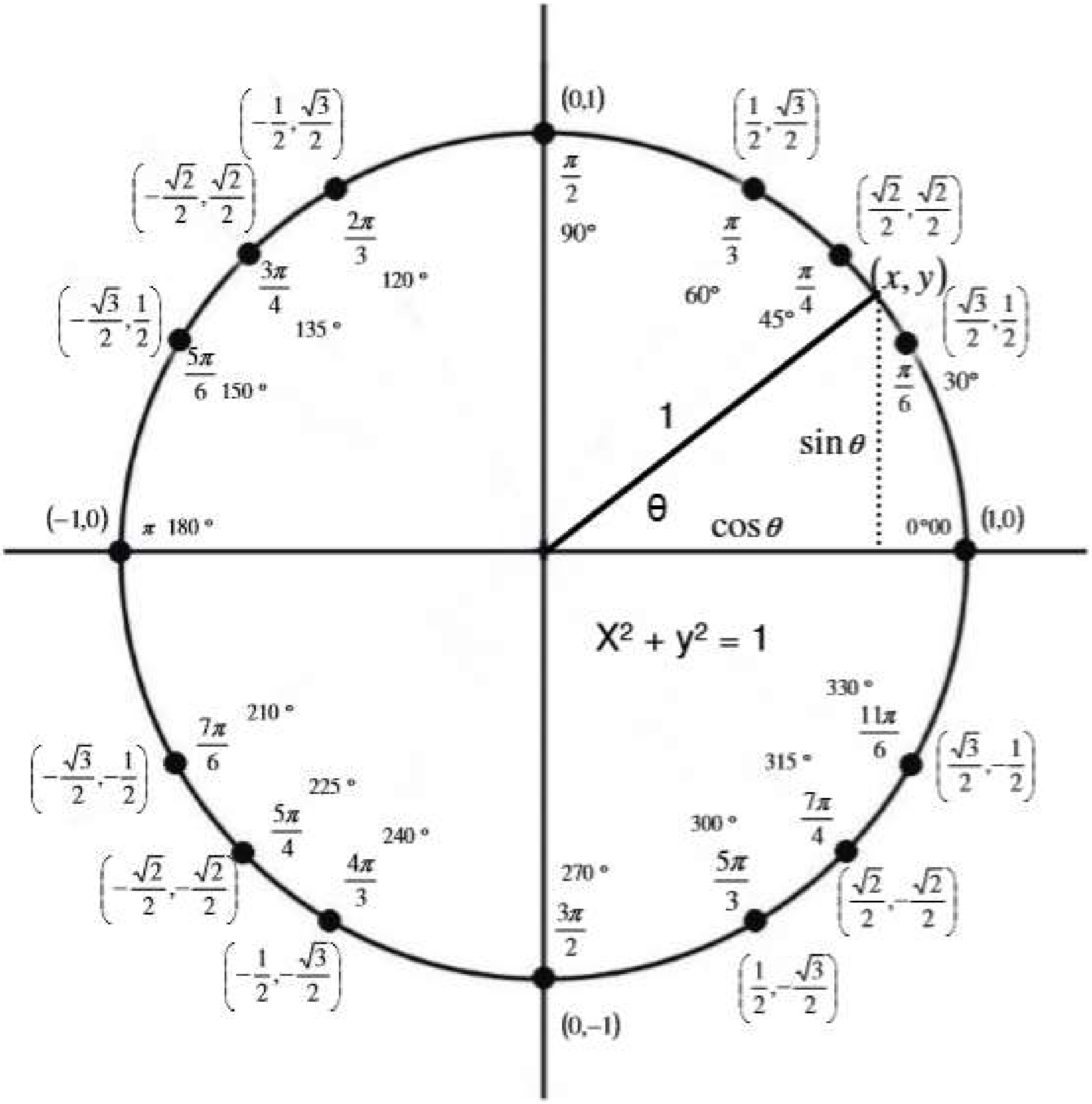
Note: **Remember the Chain Rule! If the variable in the function is not just plain x but is u(x), you must multiply the results by** $\frac{du}{dx}$.

Product Rule: $(uv)' = uv' + vu'$

Quotient Rule: $\left(\frac{u}{v}\right)' = \frac{vu' - uv'}{v^2}$

TABLE 4.2 Antiderivative formulas, k a nonzero constant

	Function	General antiderivative		Function	General antiderivative
1.	x^n	$\frac{1}{n+1}x^{n+1} + C, \quad n \neq -1$	**8.**	e^{kx}	$\frac{1}{k}e^{kx} + C$
2.	$\sin kx$	$-\frac{1}{k}\cos kx + C$	**9.**	$\frac{1}{x}$	$\ln\lvert x\rvert + C, \quad x \neq 0$
3.	$\cos kx$	$\frac{1}{k}\sin kx + C$	**10.**	$\frac{1}{\sqrt{1-k^2x^2}}$	$\frac{1}{k}\sin^{-1} kx + C$
4.	$\sec^2 kx$	$\frac{1}{k}\tan kx + C$	**11.**	$\frac{1}{1+k^2x^2}$	$\frac{1}{k}\tan^{-1} kx + C$
5.	$\csc^2 kx$	$-\frac{1}{k}\cot kx + C$	**12.**	$\frac{1}{x\sqrt{k^2x^2-1}}$	$\sec^{-1} kx + C, \quad kx > 1$
6.	$\sec kx \tan kx$	$\frac{1}{k}\sec kx + C$	**13.**	a^{kx}	$\left(\frac{1}{k \ln a}\right)a^{kx} + C, \quad a > 0, \ a \neq 1$
7.	$\csc kx \cot kx$	$-\frac{1}{k}\csc kx + C$			



The Unit Circle