C12 - 0.0 - Remember

$y' = \frac{dy}{dx} = f'(x)$ $\boxed{f'(2) = m \text{ @ } 2}$ $y'' = \frac{d^2y}{dx^2}$ $y = f(x)$ $y' = f'(x)$ $y'' = f''(x)$

$a^2 - b^2 = (a-b)(a+b)$ Difference of Squares
$a^3 - b^3 = (a-b)(a^2+ab+b^2)$ Difference of Cubes
$a^3 + b^3 = (a+b)(a^2-ab+b^2)$ Sum of cubes
SOP

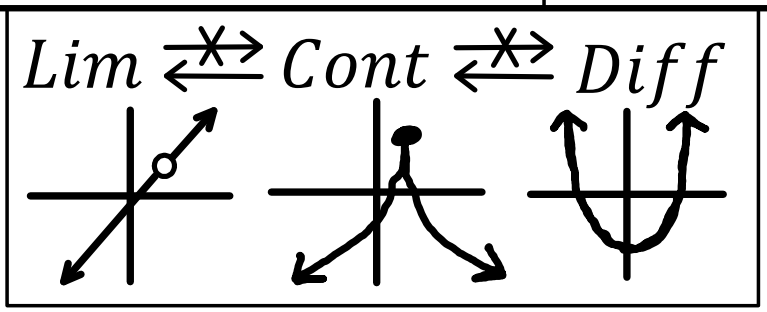
Trig *Radians $\lim_{x\to\infty} \frac{sinx}{x} = 0$ Squeeze Theorem

L'hopital's Rule

$\lim_{x\to 0} \frac{sinx}{x} = 1$ $\lim_{x\to 0} \frac{tanx}{x} = 1$

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

Continuity means Limit Exists, Limit Exists doesn't mean Continuous



Differentiable means Continuity, Continuity doesn't mean Differentiable.

Limit Exists if and only if:
$LHL = RHL$
$\lim_{x\to a^-} f(x) = \lim_{x\to a^+} f(x)$

Limit DNE:
Jump, VA*, Endpoint*

Continuous:
$\lim_{x\to a} f(x) = f(a)$
Limit exists and equals the value of the function.
Obviously!

Differentiability:
$LHD = RHD$
$\lim_{h\to 0^-} \frac{f(x+h)-f(x)}{h} = \lim_{h\to 0^+} \frac{f(x+h)-f(x)}{h}$
$\lim_{x\to a^-} f'(x) = \lim_{x\to a^+} f'(x) = f'(a)$

DisCont:
Jump, Infinite (VA), Removable (Point/Hole)

Non Diff:
Cusp, Corner, m=∞, VA, Hole

$f(x): Inc$	$f(x): Dec$	*CP Max*	*CP Min*	*Conc Up*	*Conc Down*	*IP*
$f' > 0$	$f' < 0$	$f' = 0$	$f' = 0$	$f'' > 0$	$f'' < 0$	$f'' = 0$ *and*
		$f' + \to -$	$f' - \to +$	f': *Inc*	f': *Dec*	$f'' + \to -$ OR $f'' - \to +$
						f': *Inc* $\to$ *Dec* f': *Dec* $\to$ *Inc*

VA are Critical Values: Put VA's (Inf Dis), f(x)=UND, Cusp, $f' = 0$, $f'' = 0$ etc! on number lines

Integrals: Check by taking the Derivative

Don't forget Initial Condition!

y — *position* $p(t)$
y' — *velocity* $v(t)$
y'' — *acceleration* $a(t)$
(m between y'' and y)

Down - Derivative
Up - Integral

Velocity and Acceleration
Same sign - speeding up
Diff sign - slowing down

FUNDAMENTAL THEOREM OF CALCULUS PART 2

$$\frac{d}{dx}\int_a^x f(t)dt = f(x) \times x' - f(a) \times a'$$

$$\frac{d}{dx}\int_{g(x)}^{h(x)} f(t)dt = f(h(x))\,h'(x) - f\big(g(x)\big)g'(x)$$

Put the top thing in, times by the derivative of the top thing, minus
Put the bottom thing in, times by the derivative of the bottom thing
Integral goes away.

Root Rule* $\frac{d}{dx}\sqrt{f(x)} = \frac{f'(x)}{2\sqrt{f(x)}}$