

# MATH140 Final Cheat Sheet

by 02gguzman via cheatography.com/129999/cs/25725/

#### Limits

 $\begin{tabular}{ll} \hline 2 & Precise Definition of a Limit Let $f$ be a function defined on some open interval that contains the number $a$, except possibly at $a$ itself. Then we say that the limit of $f(x)$ as $x$ approaches $a$ is $L$, and we write$  $\lim_{x \to a} f(x) = L$ 

if for every number  $\epsilon > 0$  there is a number  $\delta > 0$  such that

 $\text{if} \quad 0 < |x - a| < \delta \qquad \text{then} \qquad |f(x) - L| < \varepsilon$ 

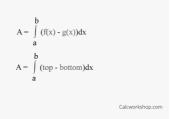
#### One Sided Limits

Show that the side you are evaluating exists If it is defined @ value plug it in

#### First/ Second Derivative To

I list Second Delivative Tests	
First	Second
1. Take derivative and find <i>c.v.</i>	1. Take and find c.v.
2. Use a sign chart	2. Use a sign chart
+ is inc. / - is dec.	+ is CC up / - is CC down
shows extrema	shows inflection points
* test endpoints	*if checking extrema sign is the opposite

#### **Area Between Curves**



### Derivative of an Integral

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

#### **Limit Definition of Derivatives**

$$\frac{dy}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$m = \lim_{x \to a} \frac{f(x) - f(a)}{x \to a}$$

# **Power Rule**

$$rac{d}{dx}x^n=n\cdot x^{n-1}$$

#### Product/Quotient Rule

# Chain Rule

 $\frac{d}{dx}\left[\left(f(x)\right)^{n}\right] = n\left(f(x)\right)^{n-1} \cdot f'(x)$  $\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$ 

#### Intermediate Value Theorem

IF f is a function that is continuous over the interval [a,b] and m is some number between f(a) and f(b), THEN there exists a number c between and b such that f(c)=m.

#### Mean Value Theorem

 $f'(c) = \frac{f(b) - f(a)}{b - a}$ 

#### Rolle's Theorem

- [a,b] is continuous - (a,b) is differentiable - f(a)=f(b) THEN: f'(c) = 0

## **Newton Raphson Method**

$$X_{n+1} = X_n - \frac{f(X_n)}{f'(X_n)}$$

#### **Related Rates**

- 1. Draw a picture and label
- 2. Use formula for area/volume of shape
- 3. Take derivative of formula
- 4. Plug in values to each formula as
- \*One variable will NOT have a rate of change (ex. ladder)



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Published 16th December, 2020. Last updated 16th December, 2020. Page 1 of 1.

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