|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Limits**=Steps: 1. Try to plug in
2. Try algebra to reduce
3. Graph it!

**Definition of Continuity:**A function is continuous at the point x=a if and only if:1. f(a) exists2. 3. **Vertical Asymptotes:****Horizontal Asymptotes:****Squeeze Theorem:****Intermediate Value Theorem**If f(x) is continuous on [a,b], and f(a) < k < f(b), then there must exist a c on (a,b) such that f(c)=k.**Extreme Value Theorem**If f(x) is continuous on [a,b], then  for some c and d on [a,b].**Rolle’s Theorem**If f(x) is continuous on [a,b] and differentiable on (a,b), and f(a)=f(b), then there must exist a c on (a,b) such that: | **Derivatives**Definition of Derivative Alternate Form of Def. of Derivative**Equation of a tangent line at x=a****Chain Rule**

|  |  |
| --- | --- |
| f(g(x)) |  |

**Product Rule**

|  |  |
| --- | --- |
| f . g | f . g’ + g .  f’ |

**Quotient Rule**

|  |  |
| --- | --- |
|  |  |

**Curve Sketching and Analysis****Critical Points**: f ‘(x) is 0 or und.Increasing: f’ > 0Decreasing: f’ < 0**Relative Min**: f’ changes signs from – to +or f’=0 or und and f “ > 0.**Relative Max**:f’ changes signs from + to -or f’=0 or und and f “ < 0.**Absolute Extrema**:Check endpoints! Candidates test or global argument.Concave Up:f “ >0 or f’ is increasingConcave Down:f ’ < 0f ” > 0f ’ > 0f ” > 0f ’ > 0f ” < 0f ’ < 0f ” < 0f “ <0 or f’ is decreasingPoint of Inflection:f ” changes signs. | **More Derivatives**Where u is a function of x and a is a constant

|  |  |
| --- | --- |
| **function** | **derivative** |
| xn | nxn-1 |
| sin u | cos u du |
| cos u | -sin u du |
| tan u | sec2 u du |
| csc u | -csc u cot u du |
| sec u | sec u tan u du |
| cot u  | -csc2 u du |
| arcsin u |  |
| arccos u |  |
| arctan u |  |
| arccsc u |  |
| arcsec u |  |
| arccot u |  |
| eu |  |
| ln u |  |
|  |  |
|  |  |

**Derivative of an Inverse**(a,b) on f(x)g(x) = f -1 (x) **The Mean Value Theorem**(derivatives)If f(x) is continuous on [a,b] and differentiable on (a,b), then there must exist a c on (a,b) such that:  |
| **The Fundamental Theorem of Calculus****Corollary to FTC****Mean Value Theorem for Integrals**(Average Value) **Other integration rules:****Area between two curves:****Solids of Revolution** Disk Method Washer Method | **Distance, Velocity, and Acceleration**s(t) is the position function, **velocity** = s’(t)**acceleration** = **Values**: **speed** =Speed is increasing when v(t) and a(t) have the same sign.**position**=s(a)+**Total distance** **average velocity =** **l'Hôpital's Rule** :**Volumes of Known Cross Sections:** (Perpendicular to x-axis) (Perpendicular to y-axis)Squares: Rectangles: Equilateral Triangles: Isosceles Right Triangles: Semicircles: **Riemann Sums:**Image result for riemann sum image**Trapezoidal Sum:** Area of a trapezoid:Image result for image trapezoidal sum**Limit definition of an Integral:**Area = = |  **Trig Study Sheet****Signs**: All Students Take CalculusAll functions are positivesincsctancotcossec

|  |  |  |  |
| --- | --- | --- | --- |
|  | 30° | 45° | 60° |
| sin θ |  |  |  |
| cos θ |  |  |  |
| tan θ |  | 1 |  |

**(1,0)****(-1,0)****(0,1)****(0-1)****Quadrantals****(cos, sin)****tan = sin/cos****y = cos x** **2π****y = sin x****Trig Graphs:****2π**π**2π****y = tan x** **Pythagorean Identities:*** **Reciprocal Identities:**

* **Double Angles:**

$$sin2a=2sinacosa$$$$cos2a=cos^{2}a-sin^{2}a$$ |