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| **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) exists  2.  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’ > 0  Decreasing: 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 increasing  Concave Down:  f ’ < 0  f ” > 0  f ’ > 0  f ” > 0  f ’ > 0  f ” < 0  f ’ < 0  f ” < 0  f “ <0 or f’ is decreasing  Point 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 Calculus  All functions are positive  sin  csc  tan  cot  cos  sec   |  |  |  |  | | --- | --- | --- | --- | |  | 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:** |