Stuff You Must Know Cold for AP Test – Calculus AB (Rev 2015-16)

Values of Trig Functions for Common Angles:

0°	$\sin\theta$	$\cos\theta$	$\tan\theta$
0			
π/6			
π/4			
π/3			
π/2			
π			

Careful with Trig Values: $\tan\left(\frac{3\pi}{4}\right) = -1$ but $\arctan(-1) = -\frac{\pi}{4}$

$\sin^2\theta + \cos^2\theta = 1$ $\quad 1 + \tan^2\theta = \sec^2\theta$ $\quad 1 + \cot^2\theta = \csc^2\theta$

$\sin^2\theta = \frac{1-\cos 2x}{2}$ $\quad \cos^2\theta = \frac{1+\cos 2x}{2}$

Limits

Limits to know:

$\lim_{x\to 0}\frac{\sin x}{x} =$ $\quad \lim_{x\to 0}\frac{1-\cos x}{x} =$ $\quad \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n =$

Situations Limits Fail to Exist

1) Left side _____ Right side
2) Graph _____
3) _____ behavior (such as ____)

Definition of Continuity:

A function is continuous at the point $x = c$ if and only if:

1) $f(c)$ is _____
2) _____ exists
3) _____ = _____

Intermediate Value Theorem

1) f must be _____ on _____
2) k is between _____ and _____
3) _____ ≠ _____
4) Therefore, c must be between _____ and _____

Derivatives

FORMAL Definition of Derivative

$\frac{d}{dx}\left(f(x)\right) =$ _____

Alternate Form of Definition of a Derivative

$\frac{d}{dx}\left(f(x)\right)$ at $x = c$ is _____

Product Rule

$\frac{d}{dx}\left(f(x)g(x)\right) =$ _____

Quotient Rule

$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) =$ _____

Chain Rule

$\frac{d}{dx}\left(f(g(x))\right) =$ _____

Situations Derivatives Fail to Exist

1) _____ turns or "_____"
2) _____ Tangents
3) _____continuity

Derivatives

Where u is a function of x and c is a constant

$\frac{d}{dx}(\sin u) =$ _____ $\quad \frac{d}{dx}(\csc u) =$ _____

$\frac{d}{dx}(\cos u) =$ _____ $\quad \frac{d}{dx}(\sec u) =$ _____

$\frac{d}{dx}(\tan u) =$ _____ $\quad \frac{d}{dx}(\cot u) =$ _____

$\frac{d}{dx}(e^u) =$ _____ $\quad \frac{d}{dx}(\ln u) =$ _____

$\frac{d}{dx}(a^u) =$ _____ $\quad \frac{d}{dx}(\log_a u) =$ _____

$\left(f^{-1}\right)'(a) =$ _____

$\frac{d}{dx}(\sin^{-1} u) =$_____ $\quad \frac{d}{dx}(\csc^{-1} u) =$_____

$\frac{d}{dx}(\cos^{-1} u) =$_____ $\quad \frac{d}{dx}(\sec^{-1} u) =$_____

$\frac{d}{dx}(\tan^{-1} u) =$_____ $\quad \frac{d}{dx}(\cot^{-1} u) =$_____

Curve Sketching and Analysis

Critical Values: $\frac{dy}{dx} =$ ____ *OR* _____

Absolute/Global Max or Min: _____ Test Must include the _____ and _____

Local/Relative Minimum

If ____ changes from _____ to _____

OR $\frac{d^2y}{dx^2}$ ☐ 0

Local/Relative Maximum

If ____ changes from _____ to _____

OR $\frac{d^2y}{dx^2}$ ☐ 0

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Point of Inflection

1) If _____ OR _____ does not exist **AND**

2) if $f''(x)$ changes from _____ to _____ or _____ to _____ **OR** if $f'(x)$ changes from _____ to _____ or _____ to _____

Extreme Value Theorem

If $f(x)$ is _____ on $[a,b]$, then there exists a(n) _____ on that interval.

The Mean Value Theorem (derivatives)

Slope of _____ = Slope of _____

_____ = _____

Particle Motion

Position = _____ Velocity = _____

Speed = _____ Acceleration = _____

Displacement = _____

Total Distance travelled = _____

Speed of object **increasing** when _____ and _____ have _____ signs

Speed of object **decreasing** when _____ and _____ have _____ signs

Natural Log Values

$\ln 1 =$ $\ln e =$

Integration

Where u is a function of x and c is a constant

$\int \cos u\ du =$ _____ $\int \sin u\ du =$ _____

$\int \sec^2 u\ du =$ _____ $\int \csc^2 u\ du =$ _____

$\int \sec u \tan u\ du =$ _____ $\int \csc u \cot u\ du =$ _____

$\int \tan u\ du =$ _____ $\int \cot u\ du =$ _____

$\int \sec u\ du =$ _____ $\int \csc u\ du =$ _____

$\int \frac{du}{u} =$ _____ $\int e^u\ du =$ _____

$\int a^u\ du =$ _____ $\int \frac{du}{\sqrt{a^2-u^2}} =$ _____

$\int \frac{du}{a^2+u^2} =$ _____ $\int \frac{du}{u\sqrt{u^2-a^2}} =$ _____

Area Under The Curve (Trapezoids)

Riemann's Sum:

$\int_a^b f(x)dx =$ _____ or $A = bh$

Trapezoidal Sum:

$\int_a^b f(x)dx =$ _____ or $A = \frac{h(b_1+b_2)}{2}$

1st Fundamental Theorem of Calculus

$\int_a^b f'(x)\ dx =$ _____

Average Value of $f(x)$ on $[a,b]$:

_____

2nd Fundamental Theorem of Calculus

$\frac{d}{dx}\int_a^x f(t)dt =$ _____

2nd Fundamental Theorem (Chain Rule):

$\frac{d}{dx}\int_{g(x)}^{h(x)} f(t)dt =$ _____

Exponential Growth & Decay

General Solution for Exponential Growth

Solids of Revolution

Area between two curves: _____

Disk Method: _____

Washer Method: _____

Volume by Cross Sections: _____

Isosceles Triangle:

Squares:	Isosceles Triangle:
Semicircles:	Equilateral Triangle:

L'Hôpital's Rule:

If $\frac{f(a)}{g(b)} = \frac{}{}$ *OR* $\frac{}{}$,

then $\lim_{x\to a} \frac{f(x)}{g(x)} = \lim_{x\to a} \frac{}{}$