Everything you should know for AP Calculus...

1. Limit Definition of the Derivative: $f'(x)$=_____
2. Limit Definition of the Derivative (Alternative Form): $f'(a)$=_____
3. Average Rate of change of $f(x)$ on $[a,b]$:_____
4. Average Value of $f(x)$ on $[a,b]$:_____
5. Intermediate Value Theorem:
   - Conditions:_____
   - Conclusion:_____
6. Rolle's Theorem:
   - Conditions:_____
   - Conclusion:_____
7. Mean Value Theorem:
   - Conditions:_____
   - Conclusion:_____
8. Extreme Value Theorem:
   - Conditions:_____
   - Conclusion:_____
9. Double Angle Identities:
   - $\sin 2x$=_____
   - $\cos 2x$=_____
10. Power Reducing Identities:
   - $\sin^2 x$=_____
   - $\cos^2 x$=_____
11. Critical Number: *f* has a critical number when f'_____
12. Increasing/Decreasing:
   - *f* is increasing when f'_____
   - *f* is decreasing when f'_____
13. Concavity:
   - *f* is concave up when f' _____and f'' _____
   - *f* is concave down when f' _____and f'' _____
14. Relative Extrema (1st Derivative Test):
   - *f* has a relative maximum when f'_____
   - *f* has a relative minimum when f'_____
15. Relative Extrema (2nd Derivative Test):
   - *f* has a relative maximum when f'_____ and f''_____

- *f* has a relative minimum when f'=_____ and f''=_____

16. Point of Inflection

- *f* has a point of inflection when f' _____ and f'' _____

17. Fundamental theorem of calculus: $\int_a^b f(x)dx$=_____

18. 2nd Fundamental theorem of calculus: $\frac{d}{dx}\left[\int_a^{g(x)} f(x)dx\right]$=_____

19. Volume by discs (horizontal axis): _____

20. Volume by discs (vertical axis): _____

21. Volume by washers (horizontal axis): _____

22. Volume by washers (vertical axis): _____

23. Volume by cross sections perpendicular to the x-axis: _____

24. Volume by cross sections perpendicular to the y-axis: _____

25. Position/ Velocity/Acceleration (AB):

- Speed:_____
- Speed is increasing when: _____
- Speed is decreasing when: _____
- Total Distance on [a, b]: _____

26. Derivative Formulas

$\frac{d}{dx}[c]$=_____

$\frac{d}{dx}[x]$=_____

$\frac{d}{dx}[cx]$=_____

$\frac{d}{dx}[x^c]$=_____

$\frac{d}{dx}[f(x)g(x)]$=_____

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

$\frac{d}{dx}[f(g(x))]$=_____

$\frac{d}{dx}[\ln x]$=_____

$\frac{d}{dx}[\arcsin x]$=_____

$\frac{d}{dx}[\arctan x]$=_____

$\frac{d}{dx}[e^x]$=_____

$\frac{d}{dx}[\sin x]$=_____

$\frac{d}{dx}[\cos x]$=_____

$\frac{d}{dx}[\tan x]$=_____

$\frac{d}{dx}[\cot x]$=_____

$\frac{d}{dx}[\sec x]$=_____

$\frac{d}{dx}[\csc x]$=_____

27. Integration Formulas

$\int dx =$ _____

$\int x^n dx =$ _____

$\int \frac{dx}{x} =$ _____

$\int e^x dx =$ _____

$\int \sin x dx =$ _____

$\int \cos x dx =$ _____

$\int \tan x dx =$ _____

$\int \csc x dx =$ _____

$\int \sec x dx =$ _____

$\int \cot x dx =$ _____

$\int \sec^2 x dx =$ _____

$\int \csc^2 x dx =$ _____

$\int \sec x \tan x dx =$ _____

$\int \csc x \cot x dx =$ _____

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

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

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

BC TOPICS

28. $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^{x}$ = _____

29. Integration by parts: $\int udv$ = _____

30. Arc Length of f on [a, b]: _____

31. Vectors

- Position: $\left(x(t),y(t)\right)$
- Velocity: _____
- Acceleration: _____
- Speed (or magnitude of the velocity vector): _____
- Distance traveled on [a, b]: _____
- $\frac{dy}{dx}$ _____
- $\frac{d^2y}{dx^2}$ _____

32. Polar

- x=_____
- y=_____
- Slope of a polar curve: _____
- Area enclosed by a polar curve on $[\alpha,\beta]$: _____
- Area between two polar curves on $[\alpha,\beta]$: _____
- Polar Arc Length:_____

33. Basic 5 Maclaurin Series

- e^x = _____

- $\sin x$ = _____

- $\cos x$ = _____

- $\frac{1}{1-x}$ = _____

- $\arctan x$ = _____

34. Lagrange Error Bound: _____

35. Alternating Series Error Bound: _____