AP Calculus – Final Review Sheet

When you see the words ….	This is what you think of doing
1. Find the zeros of a function.	
2. Find equation of the line tangent to f(x) at (a,f(a)).	
3. Find equation of the line normal to f(x) at (a,f(a)).	
4. Show that f(x) is even.	
5. Show that f(x) is odd.	
6. Find the interval where f(x) is increasing.	
7. Find the interval where the slope of f(x) is increasing.	

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8. Find the relative minimum value of a function f(x).	
9. Find the absolute minimum slope of a function f(x) on [a,b].	
10. Find critical values for a function f(x).	
11. Find inflection points of a function f(x).	
12. Show that $\lim_{x \to a} f(x)$ exists.	
13. Show that f(x) is continuous.	
14. Show that a piecewise function is differentiable at the point *a* where the function rule splits such as $h(x) = \begin{cases} f(x) \text{ for } x \le a \\ g(x) \text{ for } x > a \end{cases}$	
15. Find vertical asymptotes of a function f(x).	

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16. Find horizontal asymptotes of function f(x).	
17. Find the average rate of change of f(x) on [a,b].	
18. Find instantaneous rate of change of f(x) on [a,b].	
19. Find the average value of f(x) on [a,b].	
20. Find the absolute maximum of f(x) on [a,b].	
21. Show that a piecewise function is differentiable at the point *a* where the function rule splits	
22. Given s(t), the position function, find v(t), the velocity function.	

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23. Given v(t), the velocity function, find how far a particle travels on [a,b].	
24. Find the average velocity of a particle on [a,b] given s(t), the position function. Find the average velocity of a particle on [a,b] given v(t), the velocity function.	
25. Given v(t), the velocity function, determine the intervals where a particle is speeding up.	
26. Given v(t), the velocity function, and s(0), the initial position, find s(t), the position function as a function of t.	
27. Show that Rolle's Theorem holds for a function f(x) on [a,b].	

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28. Show that the Mean Value Theorem holds for a function f(x) on [a,b].	
29. Find domain of f(x).	
30. Find range of f(x) on [a,b].	
31. Find range of f(x) on $(-\infty, \infty)$.	
32. Find f ‘ (x), the derivative of f(x), by definition	

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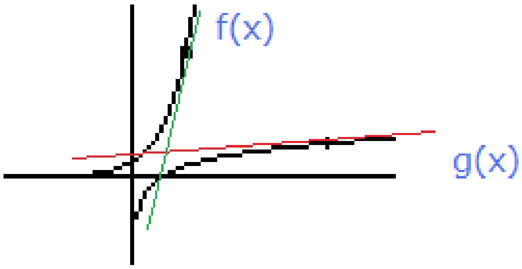
33. Given two functions f and f^{-1} are inverse functions ($f(a)=b$ and $f^{-1}(b)=a$) and $f'(a)$, find derivative of inverse function f^{-1} at $x=b$. Suppose that $g^{-1}(x)=f(x)$ and $g(x)=f^{-1}(x)$. Suppose a tangent line is drawn at (a,b) on the function f. Find the slope of the function g at the point (b,a). 	
34. Given $\dfrac{dy}{dt}$ is increasing proportionally to *y*, find a family of functions that describe the population as a function of time.	

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35. Find the line x=c that divides the area under f(x) on [a,b] to two equal areas.

36. $\dfrac{d}{dx}\int_{a}^{x} f\left(t\right)\ dt =$

37. Given that u is some function of x

find $\dfrac{d}{dx}\int_{a}^{u} f\left(u\right)\ dt =$

38. Find the area bounded by f(x), the x-axis, x=1 and x = 10 using 3 trapezoids, where $\Delta x=3$.

39. Approximate the area bounded by f(x), the x-axis, x=0 and x = 7 using left Reimann sums from information about f(x) given in tabular data.

x	0	1	5	7
y	1	13	16	5

40. Approximate the area bounded by f(x), the x-axis, x=0 and x = 7 using right Reimann sums from information about f(x) given in tabular data.

x	0	1	6	7
y	-1	-13	-16	-5

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41. Approximate the area bounded by f(x), the x-axis, x = 0, and x = 14 using two subintervals and midpoint rectangles from information about f(x)

x	0	3	6	10	14
y	1	7	12	11	3

42. Approximate the area bounded by f(x), the x-axis, x = 0, and x = using three trapezoids from information about f(x) given in tabular data.

x	1	5	6	10
y	2	7	12	15

43. Given the graph of f ‘ (x) >0 between x=0 and x = a and f(0) =8, find f(a).

44. Solve the differential equation $\frac{dy}{dx} = \frac{1+x}{y}$.

45. Describe the meaning of $\int_{a}^{x} f(t)\ dt$

46. Given a base is bounded by x = a, x = b, f(x) and g(x), where f(x) < g(x) for all a<x<b, find the volume of the solid whose cross section, perpendicular to the x-axis are squares.

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47. Find where the tangent line to f(x) is horizontal.	
48. Find where the tangent line to f(x) is vertical.	
49. Find the minimum acceleration given v(t), the velocity function.	
50. Approximate the value of f(1.1) by using the tangent line to *f* at x=1.	
51. Given the value of F(a) and the fact that the anti-derivative of *f* is *F*, find F(b).	
52. Find the derivative of f(g(x)).	
52. Given $\int_a^b f(x)\,dx$, find $\int_a^b \left[f(x)+k\right]\,dx$	

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53. Given a graph of f '(x), find where f(x) is decreasing.	
54. Given v(t), the velocity function, and s(0), the initial position, find the greatest distance from the origin of a particle on [0,b].	
55. Given a water tank with *g* gallons initially, is being filled at the rate of F(t) gallons/min and emptied at the rate of E(t) gallons/min on $\left[t_1, t_2\right]$, find the amount of water in the tank at *m* minutes where $t_1 < m < t_2$.	
56. Given a water tank with *g* gallons initially, is being filled at the rate of F(t) gallons/min and emptied at the rate of E(t) gallons/min on $\left[t_1, t_2\right]$, find the rate the water amount is changing at *m*.	
57. Given a water tank with *g* gallons initially, is being filled at the rate of F(t) gallons/min and emptied at the rate of E(t) gallons/min on $\left[t_1, t_2\right]$, find the time when the water is at a minimum.	
58. Given a chart of *x* and f(x) on selected values between *a* and *b*, estimate f '(c) where *c* is between *a* and b.	

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59. Given $\frac{dy}{dx}$, draw a slope field	
60. Given that f(x) < g(x). find the area between curves f(x) and g(x) between x = a and x = b on [a,b].	
61. Given that f(x) > g(x). Find the volume of the solid created if the region between curves f(x) and g(x) between x = a and x = b on [a,b]. is revolved about the x-axis.	
62. Find a limit in the form $\lim_{h \to 0} \frac{f(a+h)-f(a)}{h}$. Find the limit: $\lim_{x \to 0} \frac{\cos(x)-1}{x-1}$	
63. Given information about f(x) for x in [a,b], show that there exists a c in the interval [a,b], where .	
64. Given f " (x) and all critical values of x in (a,b) where f '(x)=0, determine the location of all relative extrema for f.	

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65. Given f '(x) in graphical form on a domain (a,b), determine the location of all relative extrema for f.	
66. Given that functions f and g are twice differentiable, find h '(x) if h(x) = f(x)g(x) +k.	
67. Given a differential equation $\frac{dy}{dx} = F(x, y)$ and a lattice of points on a coordinate grid, draw a slope field for the differential equation.	
68. Given a slope field that represents $\frac{dy}{dx} = F(x, y)$ on the coordinate grid. a. Determine if the slope field is a function of x alone. b. Determine if the slope field is a function of y alone. c. Determine the conditions that must be true for F(x,y) to have a slope of zero. d. Determine if the slope field illustrates special patterns along the x- or y-axes. e. Determine if the slope field illustrate special patterns in any of the quadrants. f. Determine if the slope field illustrates special patterns at x gets very large or very small. g. Determine if the slope field illustrates special patterns at y gets very large. h. Determine if the slope field illustrates any symmetry.	

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