

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.	

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 $\lim_{x \rightarrow a} f(x)$ 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 $h(x) = \begin{cases} f(x) & \text{for } x \leq a \\ g(x) & \text{for } x > a \end{cases}$	
15. Find vertical asymptotes of a function $f(x)$.	

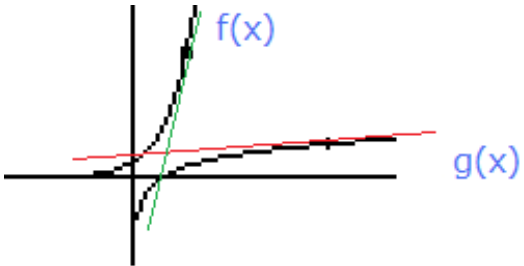
16. Find horizontal asymptotes of function $f(x)$.	
17. Find the average rate of change of $f(x)$ on $[a,b]$.	
18. Find instantaneous rate of change of $f(x)$ on $[a,b]$.	
19. Find the average value of $f(x)$ on $[a,b]$.	
20. Find the absolute maximum of $f(x)$ on $[a,b]$.	
21. Show that a piecewise 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.	

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

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	

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 $\frac{dy}{dt}$ is increasing proportionally to y , find a family of functions that describe the population as a function of time.

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

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

37. Given that u is some function of x

find $\frac{d}{dx} \int_a^u f(u) dt =$

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

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 $x = 10$ 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.

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 $\int_a^b [f(x) + k] dx$	

<p>53. Given a graph of $f'(x)$, find where $f(x)$ is decreasing.</p>	
<p>54. Given $v(t)$, the velocity function, and $s(0)$, the initial position, find the greatest distance from the origin of a particle on $[0,b]$.</p>	
<p>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 $[t_1, t_2]$, find the amount of water in the tank at m minutes where $t_1 < m < t_2$.</p>	
<p>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 $[t_1, t_2]$, find the rate the water amount is changing at m.</p>	
<p>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 $[t_1, t_2]$, find the time when the water is at a minimum.</p>	
<p>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.</p>	

<p>59. Given $\frac{dy}{dx}$, draw a slope field</p>	
<p>60. Given that $f(x) < g(x)$. find the area between curves $f(x)$ and $g(x)$ between $x = a$ and $x = b$ on $[a,b]$.</p>	
<p>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.</p>	
<p>62. Find a limit in the form $\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$.</p> <p>Find the limit: $\lim_{x \rightarrow 0} \frac{\cos(x) - 1}{x - 1}$</p>	
<p>63. Given information about $f(x)$ for x in $[a,b]$, show that there exists a c in the interval $[a,b]$, where .</p>	
<p>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.</p>	

<p>65. Given $f'(x)$ in graphical form on a domain (a,b), determine the location of all relative extrema for f.</p>	
<p>66. Given that functions f and g are twice differentiable, find $h'(x)$ if $h(x) = f(x)g(x) + k$.</p>	
<p>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.</p>	
<p>68. Given a slope field that represents $\frac{dy}{dx} = F(x,y)$ on the coordinate grid.</p> <ol style="list-style-type: none"> Determine if the slope field is a function of x alone. Determine if the slope field is a function of y alone. Determine the conditions that must be true for $F(x,y)$ to have a slope of zero. Determine if the slope field illustrates special patterns along the x- or y-axes. Determine if the slope field illustrate special patterns in any of the quadrants. Determine if the slope field illustrates special patterns at x gets very large or very small. Determine if the slope field illustrates special patterns at y gets very large. Determine if the slope field illustrates any symmetry. 	