

# AP AB Calculus Review Assignment

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- 1) How do you find the zero's of a function?
- 2) How do you find the equation of the line tangent to  $f(x)$  at  $(a, f(a))$ ?
3. How do you find equation of the line normal to  $f(x)$  at  $(a, f(a))$ .
4. How can you show that  $f(x)$  is even?
5. How can you show that  $f(x)$  is odd?
6. How do you find the interval where  $f(x)$  is increasing?
7. How do you find the interval where the slope of  $f(x)$  is increasing?
8. How do you find the relative minimum value of a function  $f(x)$ ?
9. How do you find the absolute minimum slope of a function  $f(x)$  on  $[a, b]$ ?
10. How can you find critical values for a function  $f(x)$ ?
11. How do you find inflection points of a function  $f(x)$ ?
12. How can you show that  $\lim_{x \rightarrow a} f(x)$  exists?
13. What are the requirements to 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. How do you find vertical asymptotes of a function  $f(x)$ ?
16. How do you find the horizontal asymptotes of function  $f(x)$ ?

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17. How do you find the average rate of change of  $f(x)$  on  $[a,b]$ ?
18. How do you find the instantaneous rate of change of  $f(x)$  on  $[a,b]$ ?
19. How do you find the average value of  $f(x)$  on  $[a, b]$ ?
20. How do you find the absolute maximum of  $f(x)$  on  $[a,b]$ ?
21. How can you show that a piecewise function is differentiable at the point  $a$  where the function rule splits?
22. Given  $s(t)$ , the position function, how do you find  $v(t)$ , the velocity function?
23. Given  $v(t)$ , the velocity function, how can you find how far a particle travels on  $[a,b]$ ?
24. a) How do you find the average velocity of a particle on  $[a,b]$  given  $s(t)$ , the position function?  
  
b) How do you find the average velocity of a particle on  $[a,b]$  given  $v(t)$ , the velocity function?
25. Given  $v(t)$ , the velocity function, how do you determine the intervals where a particle is speeding up?
26. Given  $v(t)$ , the velocity function, and  $s(0)$ , the initial position, how do you find  $s(t)$ , the position function as a function of  $t$ ?
27. How do you show that Rolle's Theorem holds for a function  $f(x)$  on  $[a,b]$ ?
28. How do you show that the Mean Value Theorem holds for a function  $f(x)$  on  $[a,b]$ ?
29. How do you find domain of  $f(x)$ ?
30. How do you find range of  $f(x)$  on  $[a,b]$ ?

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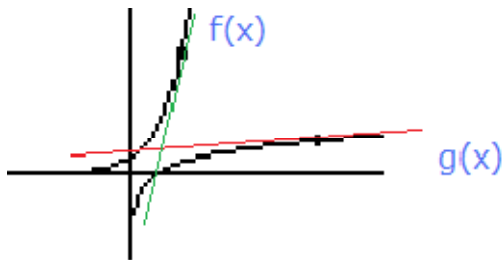
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31. How do you find the range of  $f(x)$  on  $(-\infty, \infty)$ ?

32. How do you find  $f'(x)$ , the derivative of  $f(x)$ , by the formal definition?

33. Given two functions  $f$  and  $f^{-1}$  are inverse functions ( $f(a) = b$  and  $f^{-1}(b) = a$ ) find the 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. How do you 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  $\Delta x=3$ .

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39. Approximate the area bounded by  $f(x)$ , the  $x$ -axis,  $x=0$  and  $x = 7$  using left Riemann 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 Riemann 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  $\int_a^x f(t)dt$ .

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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. How do you find where the tangent line to  $f(x)$  is horizontal?
48. How do you find where the tangent line to  $f(x)$  is vertical?
49. How do you find the minimum acceleration given  $v(t)$ , the velocity function?
50. How can you 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 antiderivative of  $f$  is  $F$ , how do you find  $F(b)$ ?
52. How do you find the derivative of  $f(g(x))$ ?
52. Given  $\int_a^b f(x) dx$ , how do you find  $\int_a^b [f(x) + k] dx$ ?
53. Given a graph of  $f'(x)$ , how do you find where  $f(x)$  is increasing?
54. Given  $v(t)$ , the velocity function, and  $s(0)$ , the initial position, how do you 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  $[t_1, t_2]$  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  $[t_1, t_2]$  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  $[t_1, t_2]$  find the time when the water is at a minimum.

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58. Given a chart of  $x$  and  $f(x)$  on selected values between  $a$  and  $b$ , how do you estimate  $f'(c)$  where  $c$  is between  $a$  and  $b$ ?

59. Given  $\frac{dy}{dx}$ , how do you draw a slope field?

60. Given that  $f(x) < g(x)$ . how do you find the area between the curves  $f(x)$  and  $g(x)$  between  $x = a$  and  $x = b$  on  $[a,b]$ ?

61. Given that  $f(x) > g(x)$ . How do you 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. a) How do you find a limit in the form  $\lim_{h \rightarrow 0} \frac{f(a+h)-f(a)}{h}$ ?

b) Find the limit  $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x - 1}$

63. Given information about  $f(x)$  for  $x$  in  $[a,b]$ , how do you show that there exists a  $c$  in the interval  $[a,b]$ ?

64. Given  $f''(x)$  and all critical values of  $x$  in  $(a,b)$  where  $f'(x)=0$ , how do you determine the location of all relative extrema for  $f$ ?

65. Given  $f'(x)$  in graphical form on a domain  $(a,b)$ , how do you determine the location of all relative extrema for  $f$ ?

66. Given that functions  $f$  and  $g$  are twice differentiable, find  $h'(x)$  if  $h(x) = f(x) \cdot g(x) + k$ .