

Mini-math Div 3/4: Monday, September 28, 2020

- (1) True or false: If a function is continuous at a point a , then it must be differentiable at the point a .

Solution: False - for example, $f(x) = |x|$ is continuous but not differentiable at $x = 0$.

- (2) True or false: If $f(a) = 0$, then $f'(a)$ must also be 0.

Solution: False - for example, $f(x) = x$ has $f(0) = 0$, but $f'(0) = 1$.

- (3) True or false: If $f'(a) = 0$, then $f(a)$ must also be 0.

Solution: False - for example, $f(x) = x^2 + 1$ has $f'(0) = 0$, but $f(0) = 1$.

- (4) Write an expression to compute the derivative of a function $f(x)$ at the point x , assuming it is differentiable.

Solution:

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \text{or} \quad \lim_{t \rightarrow x} \frac{f(t) - f(x)}{t - x}$$

- (5) Give your best estimate of the derivative $f'(3)$ given the following table of values:

x	2.9	3	3.1	3.2
$f(x)$	1.5	2	3	3.5

Solution:

$$f'(3) \approx \frac{f(3.1) - f(2.9)}{3.1 - 2.9} = \frac{3 - 1.5}{0.2} = 7.5$$

or

$$f'(3) \approx \frac{f(2.9) - f(3)}{2.9 - 3} = \frac{1.5 - 2}{-0.1} = 5$$