Calculus

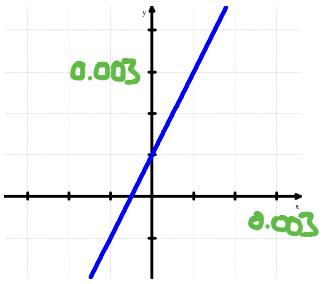
Write your questions and thoughts here!

2.3 Differentiability

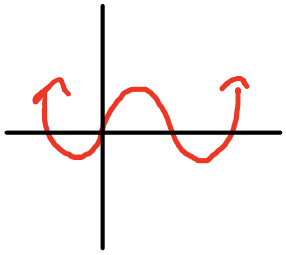
Name:_____

Notes

A graph of a function is shown below. Write down its equation on line #1.



1. $y =$ 2x+1 (No scale)
2. $y =$ 2x+0.001 (too much zoom)
3. $y =$ sin(2x)+0.001

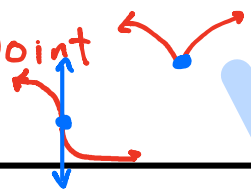


Differentiability: (Slope)

The derivative exists for each point in the domain. In other words, the graph looks like a line if you zoom in (local linearity).

The derivative fails to exist where the function has a

1. Discontinuity
2. Corner or cusp point
3. Vertical tangent

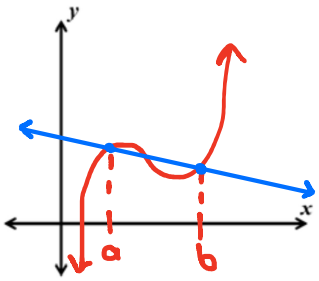


True or **False**	**True** or **False**
Differentiability implies continuity.	Continuity implies differentiability.

NASTY Theorem

Mean Value Theorem:

If a function f is differentiable (and thereby continuous) over the interval (a,b), then there exists a point c within that open interval where the instantaneous rate of change equals the average rate of change over the interval.



$f'(c) = ARC(c)$

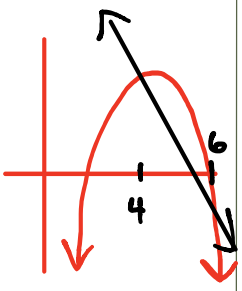
2.3 Differentiability

Notes

Write your questions and thoughts here!

Given $f(x)$ and $f'(x)$ on a given interval $[a, b]$, find a value c that satisfies the Mean Value Theorem.

1. $f(x) = -2x^2 + 16x - 26;\ \ 4 \le x \le 6$
   $f'(x) = -4x + 16$



① $f(6) = -2(6)^2 + 16(6) - 26$
$= -2(36) + 96 - 26$
$= -72 + 70$
$f(6) = -2$

② $f(4) = -2(4)^2 + 16(4) - 26$
$= -2(16) + 64 - 26$
$= -32 + 38$
$f(4) = 6$

③ FIND ARC

$ARC = \frac{f(6) - f(4)}{6 - 4}$
$= \frac{(-2) - (6)}{2}$
$= \frac{-8}{2}$
$ARC = -4$ (slope of secant)

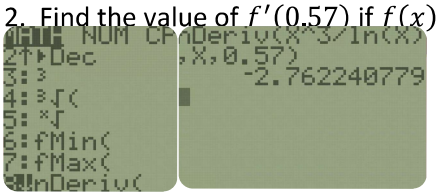
④ Set $ARC = f'(c)$

$-4 = -4c + 16$
$-20 = -4c$
$5 = c$

Derivatives and Calculators:

Using the calculator to find the value of the derivative at a point.

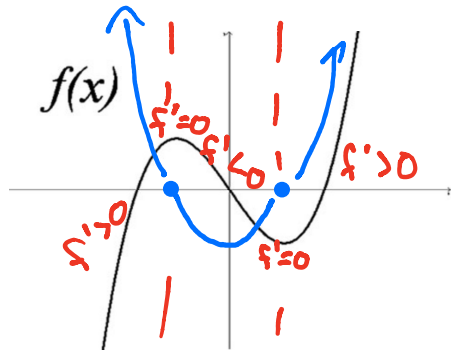
2. Find the value of $f'(0.57)$ if $f(x) = \frac{x^3}{\ln x}$



$f'(0.57) = -2.762$

Graph of a function f and its derivative f'

Focus on the Slope of f. The Slope of f is the y-value of f'.



BLUE = f'

Now summarize what you learned!