WARM UP

1. Find the average rate of change of the following function over the given interval.

$$y = \frac{2x+1}{x+2}, [1,3]$$

AROC $= \frac{f(x_1) - f(x_2)}{x_1 - x_2}$

$f(1) = \frac{2(1)+1}{1+2} = \frac{3}{3} = 1$

(1, 1)
x y

$f(3) = \frac{2(3)+1}{3+2} = \frac{7}{5}$

$(3, \frac{7}{5})$

$= \frac{f(1) - f(3)}{1-3}$

$= \frac{1 - \frac{7}{5}}{-2}$

$= \frac{-\frac{2}{5}}{-2}$

$\to -\frac{2}{5} \times -\frac{1}{2}$

$= \frac{2}{10}$

$m = \frac{1}{5}$

2. Find the equation of the secant line connecting the points x=1 and x=3 on the function above.

$y = mx + b$

$y = \frac{1}{5}x + b$ use pt (1,1)

$1 = \frac{1}{5}(1) + b$

$1 = \frac{1}{5} + b$

$\frac{5}{5} = \frac{1}{5} + b$

$\frac{4}{5} = b$

$y = \frac{1}{5}x + \frac{4}{5}$

Jan 9-1:43 PM

Calculus 120
Unit 1: Rate of Change and Derivatives

January 31, 2019: Day 2

1. Course Outlines Distributed

2. Assignment #1 Due on Monday

3. Textbook Sign-Out

4. Any questions from yesterday?

Curriculum Outcomes

C1. Explore the concepts of average and instantaneous rate of change.

Discuss rate of change in relation to velocity of a car.

Discuss interest rates at banks.

Investigation: Calculating Instantaneous Rate of Change

An object is dropped from rest from the top of a cliff. Its height in metres, after t seconds, can be calculated using the function $h(t) = -4.9t^2 + 50$.

1. Calculate the average rate of change over the following time intervals:

a) [0,3] : −14.7 b) [1,3] c) [2,3] d) [2.5, 3] e) [2.9, 3]

−19.6 −24.5 −26.95 −28.9.... −29

f) [2.99,3]

−29
−28.999....

2. Sketch the function and secant lines to represent the averages rates of change above.

3. How can we calculate instantaneous rate of change algebraically? graphically?

$y = -4.9t^2 + 50 \quad [0, 3]$

$AROC = \frac{f(x_1) - f(x_2)}{x_1 - x_2}$

$= \frac{f(0) - f(3)}{0 - 3}$

$\frac{50 - (-4.9(3)^2 + 50)}{-3}$

$\frac{44.1}{-3} = -14.7 \text{ m/s}$

$f(0) = 0 + 50 = 50$

$f(3) = -4.9(3)^2 + 50$

$= -4.9(9) + 50$

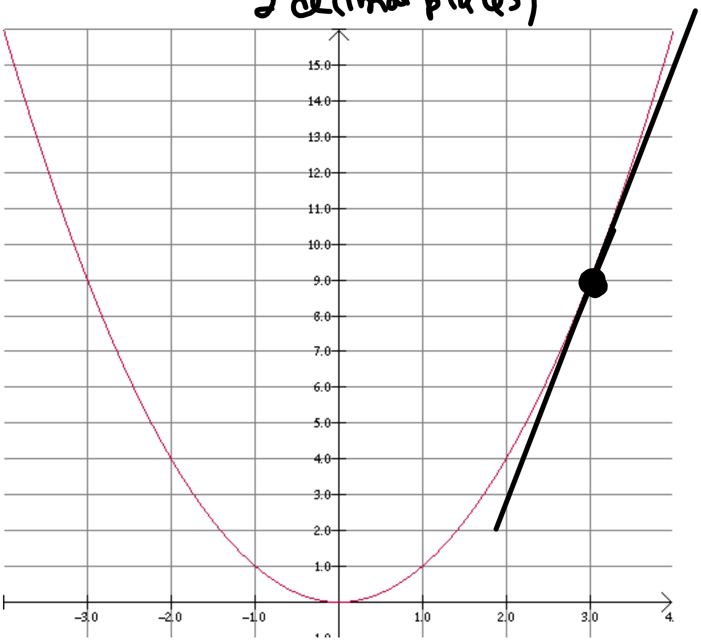
$= -44.1 + 50$

$= 5.9$

Jan 31-10:24 AM

Instantaneous rate of change is the slope of a tangent line at a particular point. This value can be calculated exactly using Calculus; however, we can also approximate it by finding the average rate of change over an extremely small interval. (within at least 2 decimal places)

A tangent line is a line that touches (not intersects) a curve at one point.



Jan 29-9:25 AM

Find the IROC of the function $y = x^2 + 2x + 1$ at $x = 2$.

$IROC = \frac{f(x_1) - f(x_2)}{x_1 - x_2}$

$= \frac{f(1.99) - f(2)}{1.99 - 2}$

$= \frac{8.9401 - 9}{-0.01}$

$= \frac{-0.0599}{-0.01}$

$= 5.99$

$\therefore IROC = 6$

Use AROC from $x = 1.99$ to $x = 2$

$f(1.99) = 1.99^2 + 2(1.99) + 1$

Don't round here!!!

$= 8.9401$

$f(2) = 2^2 + 2(2) + 1$

$= 9$

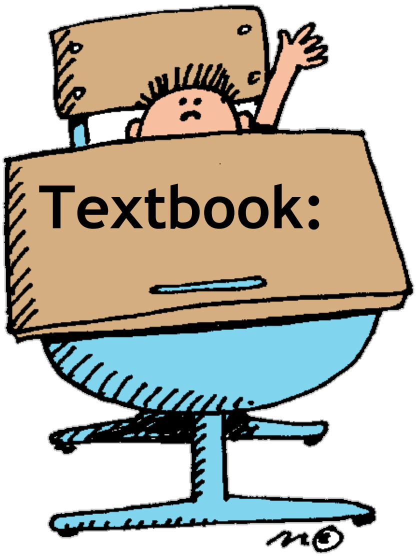
Find the IROC of the function $y = x^3 - 2x^2 + x - 4$ at $x = -1$.

A ball is dropped off the CN Tower and its velocity is modeled by the function $h(t) = -4.9t^2 + 600$, where *h* is the height of the ball in metres, and *t* is the time in seconds after the ball's release.

a) Calculate the average velocity of the ball oveer the first four seconds of flight.

b) Calculate the velocity of the ball at exactly 4.0 seconds into its decent.

Jan 29-9:31 AM



Minimum Preparation

Page 66-67 #3, 4, 69b, 70c

Jan 31-10:57 AM

Attachments

2.1_74_AP.html

2.1_74_AP.swf

2.1_74_AP.html