

Intro to Calculus

Lesson for Homework 23

Goals

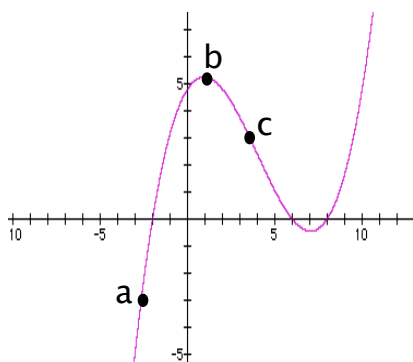
I can approximate the value of the derivative when given an equation, graph, or table of values.

In Lesson for Homework 22 you:

- explored functions for which an equation was given relating two variable quantities,
- found the average rate of change of the dependent variable with respect to the independent variable,
- estimated the instantaneous rate of change (the derivative).

In this section you will do the same for functions specified not only by an equation but also by a graph or by a table.

1. Take a look at the graph below:



As x increases, what's happening to the value of y as you approach point a ? As you approach point b ? As you approach point c ?

- Where would you say that y is decreasing the fastest as x increases?
- At how many places does y neither increase nor decrease?

4. Now let's think about a different situation. Suppose that you have a mass bouncing up and down on a spring hanging from the ceiling. Its distance, y feet, from the ceiling is measured by strobe photography each $1/10$ sec. Here's the data:

time (sec)	distance (feet)
0.2	3.99
0.3	5.84
0.4	7.37
0.5	8
0.6	7.48
0.7	6.01
0.8	4.16
0.9	2.63
1	2
1.1	2.52

- Is the mass moving up or down at $t=0.3$ seconds?
- What do you think would be a good estimate for the rate of change of the distance with respect to the time at $t=0.3$ sec?

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5. Estimate the rate the distance is changing at $t=0.6$ and $t=1.0$ seconds.
6. Now suppose that an inflated toy balloon is tied to a small rock, then the rock and balloon are thrown into the air. While it is moving, the rock's height, $f(x)$ feet above the ground is modeled by the equation:

$$f(x) = -x^2 + 8x + 2$$

where x is time in seconds since the rock was thrown. Find the approximate rate of change of the height with respect to time when $x = 3$.

7. Find an approximate value of the derivative of $f(x)$, which can be denoted as $f'(x)$, when $x = 7$ and when $x = 4$.

8. So what does the word derivative mean?

9. What is the most important idea or technique in this lesson?