

Intro to Calculus

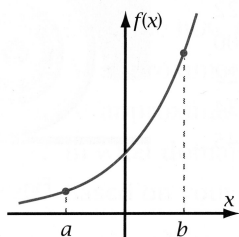
Homework 23¹

Goals

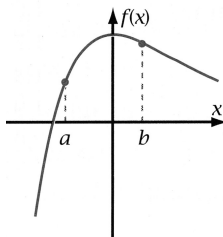
I can approximate the value of the derivative when given an equation, graph, or table of values.

1. Graphs of functions with values of x marked a and b are shown below. At each marked value, tell whether the function is increasing or decreasing, or neither as x increases, and tell whether the rate of increase or decrease is fast or slow.

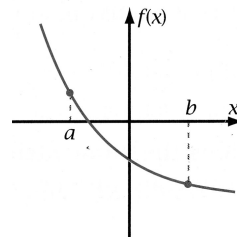
a.



b.



c.



2. Use the table of values to find, approximately, the rate of change of y for the following values of x and tell whether y is increasing or decreasing.

x (minutes)	y (cm)
0.0	10.0
0.5	7.6
1	8.0
1.5	10.4
2	14.0
2.5	18.1
3	22.0
3.5	24.9
4	26.0
4.5	24.6

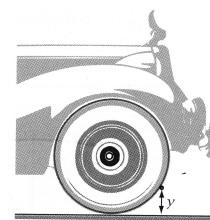
a. $x = 1.5$

b. $x = 3$

c. $x = 4$

x (sec)	y (inches)
1.2	0.63
1.3	0.54
1.4	0.45
1.5	0.34
1.6	0.22
1.7	0.00
1.8	0.22
1.9	0.34
2	0.45
2.5	24.6

3. A pebble is stuck in the tread of a car tire. As the wheel turns, the distance, y inches, between the pebble and the road at time t is given in the chart.



- a. About how fast is y changing at each of the following times.
- $t = 1.4$
 - $t = 1.7$
 - $t = 1.9$
- b. At what time does the pebble strike the pavement. Justify.

¹ Adapted from Calculus, Foerster, pp. 11-13

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4. For each of the following:

i) Find $f(c)$

ii) Determine whether $f(x)$ is increasing or decreasing at $x = c$

iii) Approximate the rate of change at $x = c$ by finding the average rate of change over a small interval. Justify with clear and complete work.

a. $f(x) = x^2 + 5x + 6$, $c = 3$

b. $f(x) = \frac{1}{x-5}$, $c = 4$

c. $f(x) = \sin(x)$, $c = 2$ (radians)

d. $f(x) = \tan(x)$, $c = \frac{\pi}{4}$

5. The temperature during the day can be approximated by a sinusoidal function. At 4 a.m. the temperature was at a low of 65°F . At 4 p.m. the temperature hit a high of 103°F .

a. Write an equation which will allow for the prediction of the temperature t hours after midnight.

b. Find the temperature at 11 a.m.

c. Find the first time in the day when the temperature reaches 98°F .

d. Approximate the rate of change of the temperature with respect to time 2 p.m by finding the average rate of change over a small interval. Justify with clear and complete work.

e. At what time is the rate of change of the temperature with respect to time the greatest? Justify.