Essentials of Calculus Homework 2.1 Rates of change

- 1. Let $f(x) = 2x^2 x$.
 - a) Approximate the average rate of change of *f* from x = 3 to x = 3.1.

Numeric answer: $\frac{\Delta y}{\Delta x} = 11.2$

b) Approximate the average rate of change of *f* from x = 3 to x = 3.05.

Numeric answer:
$$\frac{\Delta y}{\Delta x} = 11.1$$

c) Approximate the average rate of change of *f* from x = 3 to x = 3.01.

Numeric answer: $\frac{\Delta y}{\Delta x} = 11.02$

d) Approximate f'(3).

Numeric answer: $f'(3) \approx 11$

- 2. Let $f(x) = 2^x$.
 - a) Approximate the average rate of change of *f* from x = 1 to x = 1.1.

Numeric answer: $\frac{\Delta y}{\Delta x} \approx 1.435$

b) Approximate the average rate of change of *f* from x = 1 to x = 1.01.

Numeric answer: $\frac{\Delta y}{\Delta x} \approx 1.391$

c) Approximate the average rate of change of f from x = 1 to x = 1.001.

Numeric answer: $\frac{\Delta y}{\Delta x} \approx 1.387$

d) Approximate f'(1).

Numeric answer: $f'(1) \approx 1.38$

3. A mouse is running directly away. In *t* seconds, it is $f(t) = 10 - 2t - 0.5t^2$ feet away.

a) Approximate the mouse's average velocity from t = 2 to t = 2.1 seconds.

Numeric answer: The average velocity will be about -4.05 feet/sec.

b) Approximate the average velocity from t = 2 to t = 2.01 seconds.

Numeric answer: The average velocity will be about -4.005 feet/sec.

c) Approximate the average velocity from t = 1.99 to t = 2 seconds.

Numeric answer: The average velocity will be about -3.995 feet/sec.

d) Approximate the mouse's velocity at t = 2 seconds.

Numeric answer: The velocity will be about -4 feet/sec.

4. Suppose that *f* has values given by the following table.

x	0	0.5	1	1.5
f(x)	1	1.25	2	3.25

Approximate f'(1).

Numeric answer: $f'(1) \approx 2.5$

5. Suppose that in *t* hours, a biker has traveled the following distances (measured in miles).

t	1	1.25	1.5	1.75
distance	20	25	31	35

Approximate the biker's velocity in 1.5 hours.

Numeric answer: The velocity will be about 16 miles/hour.

6. Suppose that the graph y = f(x) looks like



For each value, state whether it is positive, negative or zero.

a) f'(-1)Numeric answer: f'(-1) < 0b) f'(0)Numeric answer: f'(0) > 0c) f'(1)Numeric answer: f'(1) = 0d) f'(2)Numeric answer: f'(2) = 0e) f'(3)Numeric answer: f'(3) < 0

7. Suppose that the graph y = f(x) looks like



Approximate the following values:

a) f'(-1)Numeric answer: $f'(-1) \approx 1$ b) f'(0)Numeric answer: $f'(0) \approx 1/2$ c) f'(1)Numeric answer: $f'(1) \approx -1$ d) f'(2)Numeric answer: $f'(2) \approx 0$ e) f'(3)Numeric answer: $f'(3) \approx -1$