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 $x = 3.1$.

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

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

   d) Approximate $f'(3)$.

2. Let $f(x) = 2^x$.

   a) Approximate the average rate of change of f from $x = 1$ to $x = 1.1$.

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

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

   d) Approximate $f'(1)$.

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.

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

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

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

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

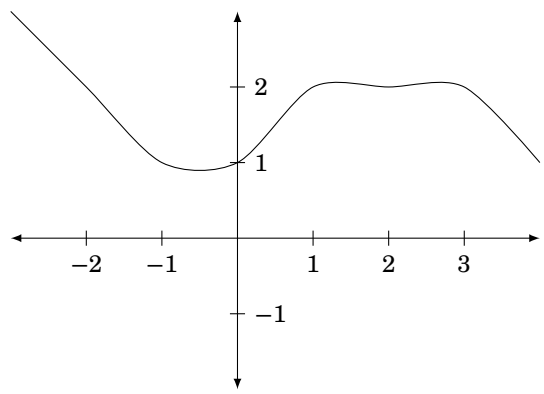
Approximate $f'(1)$.

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.

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



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

a) $f'(-1)$

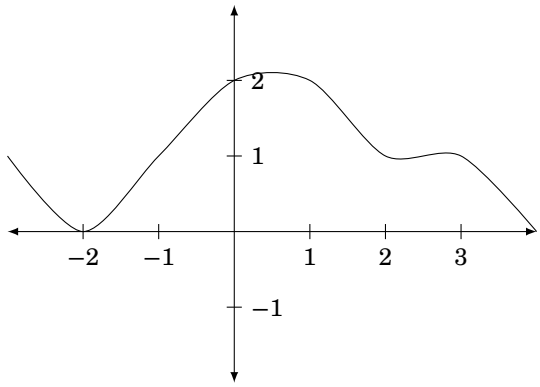
b) $f'(0)$

c) $f'(1)$

d) $f'(2)$

e) $f'(3)$

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



Approximate the following values:

a) $f'(-1)$

b) $f'(0)$

c) $f'(1)$

d) $f'(2)$

e) $f'(3)$