1. Suppose a function is given by a table of values as follows:

x	1.1	1.3	1.5	1.7	1.9	2.1
$f(x)$	12	15	21	23	24	25

   (a) Estimate the instantaneous rate of change of f at $x = 1.7$.

   (b) Use your answer in (b) to predict a value for f at $x = 1.8$.

   (c) Is your prediction too large or too small? Explain.

2. Let $f(T)$ be the time, in minutes, that it takes for an oven to heat up to temperature T °F.
   (a) Give the meaning, in plain English, of $f(300) = 10$.

   (b) What are the units of $f'(T)$?

   (c) Do you think $f'(T)$ would be positive or negative?

   (d) Give the meaning, in plain English, of $f'(300) = 0.1$

3. A sports car accelerates from 0 ft/sec to 88 ft/sec in 5 seconds (88 ft/sec = 60 mph) The car's velocity is given in the table below.

t	0	1	2	3	4	5
$V(t)$	0	30	52	68	80	88

   Find upper and lower bounds for the distance the car travels in 5 seconds.

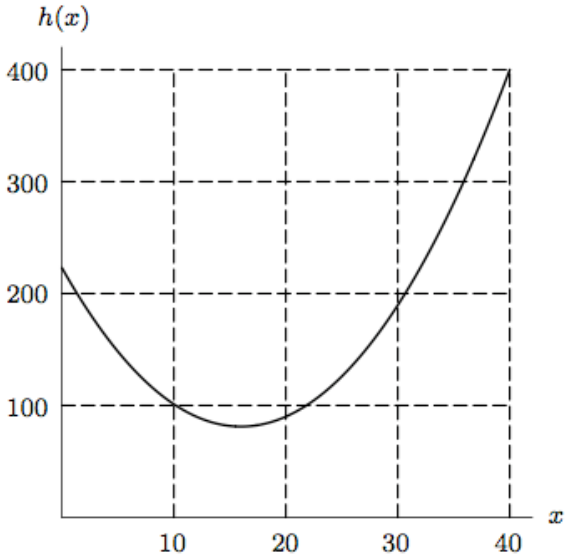
4. Let $f(t) = t^3 + t$.
   (a) What is the total change in $f(t)$ between $t = 2$ and $t = 5$?

   (b) What is the *average rate of change* in $f(t)$ between $t = 2$ and $t = 5$?

5. The flow rate of water in a mountain stream due to spring runoff is given in the following table. Give your ***best*** estimate for the total volume of water from 6:00 pm to midnight.

time (hours since 6:00 pm)	0	1	2	3	4	5	6
flow rate (in cubic meters per hour)	300	360	410	455	490	520	545

6. The graph of $h(x)$ is given to the right.



   (a) Draw on the graph (label your drawings and use different colors if you can)

      (i) A line segment whose length equals the change Δh in $h(x)$ between $x = 20$ and $x = 40$.

      (ii) A line segment whose slope equals the average rate of change $\frac{\Delta h}{\Delta x}$ of $h(x)$ between $x = 20$ and $x = 40$.

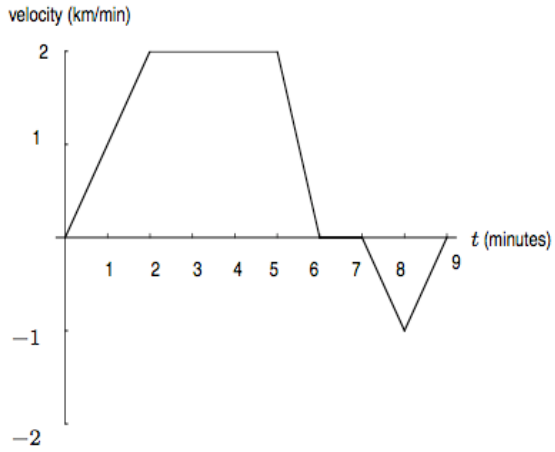
      (iii) A line whose slope equals the derivative $h'(10)$.

      (iv) A point on the graph where $h' = 0$.

   (b) Carefully estimate $h'(30)$

7. A car is moving along a straight road from A to B starting from A at time $t = 0$.

To the right is the velocity (in km/min) plotted against time (in min).



How many kilometers away from A is the car at time

(b) $t = 2$

(c) $t = 5$

(d) $t = 6$

(e) $t = 7$

(f) $t = 9$

8. Find the derivatives of the following functions. Do not simplify.

(a) $f(x) = \sqrt{x}$

(b) $y = r^2 + 7r - 17$

(c) $h(t) = t^{\pi} + \sqrt{2}\,t$

(d) $g(x) = 2e^{\pi x}$

(e) $y = \ln\left(x^3 + 4\right)$

(f) $h(z) = z\cos(3z)$

(g) $f(x) = \dfrac{\ln x + 5}{x^2 + 7}$

9. The temperature, Y, in degrees Fahrenheit of a yam in a hot oven t minutes after it is placed there is given by

$$Y(t) = 350\,(1 - 0.7e^{-0.008t})$$

(b) What was the temperature of the yam when it was placed in the oven?

(c) If the yam is left on in the oven for a long time, it will eventually reach the temperature of the oven. What is the temperature of the oven?

(d) When does the yam reach 175 ° F?

(e) What is $Y(20)$? What is $Y'(20)$? What do these quantities tell us about the temperature of the yam?