• The net change in a quantity $s(t)$ is equal to the integral of the rate of change of $s(t)$.
  - Net change between time $t = t_1$ and time $t = t_2$:
  - Rate of change at time $t$:
  - Integral of rate of change between time $t = t_1$ and time $t = t_2$:

• For an object traveling in a straight line velocity $v(t)$, what is
  - it’s displacement during the interval $[t_1, t_2]$?
  - the total distance it travelled during $[t_1, t_2]$?

• If $C(x)$ is the cost of producing $x$ units of a commodity, then $C’(x)$ is the marginal cost and the cost of increasing production from $a$-many units to $b$-many units is
(1) Find the displacement over the time interval \([1, 6]\) of a helicopter whose vertical velocity at time \(t\) is \(v(t) = 0.02t^2 + t\) feet per second.

(2) A particle is moving along a straight line with velocity \(v(t) = \cos t\) meters per second. Find
   (a) the total displacement over the interval \([0, 4\pi]\), and
   (b) the total distance travelled over the interval \([0, 4\pi]\).

(3) The velocity in feet per second of a car is recorded at half-second intervals in the table below.

<table>
<thead>
<tr>
<th>(t)</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
<th>3.5</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>(v(t))</td>
<td>0</td>
<td>12</td>
<td>20</td>
<td>29</td>
<td>38</td>
<td>44</td>
<td>32</td>
<td>35</td>
<td>30</td>
</tr>
</tbody>
</table>

Use the average of the left-endpoint and right-endpoint approximations to estimate the total distance travelled over the time interval \([0, 4]\).

(4) The heat capacity \(C(T)\) of a substance is the amount of energy (in joules) required to raise the temperature of one gram of the substance by one degree Celsius when it’s temperature is \(T\). (The heat capacity depends on the substance’s current temperature.)
   (a) Determine the energy required to raise the temperature of one gram from \(T_1\) to \(T_2\)
   (b) If a substance has heat capacity \(C(T) = 6 + 0.2\sqrt{T}\), calculate the energy required to raise the temperature of one gram of the substance from \(50^\circ\) to \(100^\circ\) Celsius.