1. (2 points) Given that \( \frac{dw}{dt} = \sqrt{w} \) and \( w(0) = 81 \), use Euler's Method with \( \Delta t = 2 \) to obtain an estimate for \( w(10) \).

<table>
<thead>
<tr>
<th>( t_{\text{current}} )</th>
<th>( w_{\text{current}} )</th>
<th>( w'_{\text{current}} )</th>
<th>( w_{\text{next}} = w_{\text{current}} + w'_{\text{current}} \Delta t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>81</td>
<td>9</td>
<td>81 + 9 (2)</td>
</tr>
<tr>
<td>2</td>
<td>99</td>
<td>9.9499</td>
<td>99 + 9.9499 (2)</td>
</tr>
<tr>
<td>4</td>
<td>118.8997</td>
<td>10.9041</td>
<td>118.8997 + 10.9041 (2)</td>
</tr>
<tr>
<td>6</td>
<td>140.7080</td>
<td>11.8620</td>
<td>140.7080 + 11.8620 (2)</td>
</tr>
<tr>
<td>8</td>
<td>164.4321</td>
<td>12.8231</td>
<td>164.4321 + 12.8231 (2)</td>
</tr>
<tr>
<td>10</td>
<td>190.0783</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[ w(10) \approx 190.1 \]

2. (2 points) Suppose that the population of a town is always growing at a rate which is proportional to the population itself. Suppose further that the population is currently 400 and is growing at a rate of 25 people per year. Find a differential equation with initial condition to model the population of this town. Use \( P \) for the population \( t \) years from now.

\[
\frac{dP}{dt} = k \cdot P
\]

\[ 25 = k \cdot 400 \]

\[ k = \frac{25}{400} = 0.0625 \]

\[
\frac{dP}{dt} = 0.0625 \cdot P
\]

\[ P(0) = 400 \]
3. (2 points) Suppose that 800 rabbits are currently on an island. Let \( R \) represent the number of rabbits on this island \( t \) months from now. Write down a differential equation with initial value to model the number of rabbits on this island under the following conditions.

(a) This rabbit population increases by 20 rabbits per month.

\[
\frac{dR}{dt} = 20
\]

\[
R(0) = 800
\]

(b) This rabbit population increases at a continuous growth rate of 2.5\% per month.

\[
\frac{dR}{dt} = 0.025R
\]

\[
R(0) = 800
\]

4. (2 points) Determine an explicit formula for the rabbit population in problem (3a).

\[
R = 20t + 800
\]

5. (2 points) Determine an explicit formula for the rabbit population in problem (3b).

\[
R = 800e^{0.025t}
\]