College Algebra
Projectile Motion Project

The height in feet, \( H(t) \), of a projectile starting from ground level can be approximated over time \( t \) (in seconds) using the following function:

\[
H(t) = v_0 t - 16t^2
\]

1. Complete the table for an initial velocity of 80 fps \( v_0 = 80 \text{ ft/sec} \). Show your set up on one problem.

<table>
<thead>
<tr>
<th>Time (seconds)</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>Height (feet)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Sketch the points on the graph provided below, and sketch a curve that contains the points in your scatter plot. Put the dependent variable on the vertical axis. Clearly label the axes, and use a consistent scale on each axis.

\[
\begin{align*}
H(t) = & v_0 t - 16t^2 \\
\end{align*}
\]

3. According to the equation, when does the projectile reach its maximum height? Show the use of the \( -\frac{b}{2a} \) method.

4. Find the maximum height the projectile reaches.

5. What is the duration of the projectile’s flight? Explain your reasoning.
6. List the following features of the parabola given by $y = -16x^2 + 80x$:

   Vertex: __________

   y-intercept: __________

   x-intercepts: __________ and __________

   Axis of symmetry: __________

7. Rewrite the equation in #6 in vertex form: $y = a(x - h)^2 + k$.

   __________________________

Do your best! Live and learn!