3. [13 points] In part (a) of this problem, you should **show your work** and make sure your answers are **exact**. Note that part (b) is independent of part (a).

a. [9 points] There are \( T(d) \) termites in an abandoned house on day \( d \). Starting at \( d = 0 \), the population of termites increases by 30% each day, and reaches a peak of 28,561 termites at \( d = 4 \). Starting at \( d = 4 \), the termite population declines at a constant rate, up until \( d = 8 \) when there are no termites left. Write a **piecewise-defined** formula for \( T(d) \) in terms of \( d \) in the spaces provided.

**Solution:** From the information above, we see that \( T(d) \) is exponential on \( 0 \leq d \leq 4 \) and linear on \( 4 < d \leq 8 \).

For \( 0 \leq d \leq 4 \): We know \( T(d) \) is exponential with percentage growth rate 0.3, so \( T(d) = a(1.3)^d \). To find \( a \), we know that \( T(4) = 28,561 \), so \( a(1.3)^4 = 28,561 \). Dividing by 1.34 gives us \( a = 10,000 \).

For \( 4 < d \leq 8 \): We know \( T(d) \) is linear with average rate of change: \[
\frac{0 - 28,561}{4} = -7,140.25
\]
Since \( T(8) = 0 \), using point-slope form gives us \( T(d) = -7,140.25(d - 8) \).

\[
T(d) = \begin{cases} 
10,000(1.3)^d & \text{if } 0 \leq d \leq 4 \\
-7,140.25(d - 8) & \text{if } 4 < d \leq 8 
\end{cases}
\]

b. [4 points] The termites at the abandoned house have begun attracting birds. The number of birds \( B \), along with the temperature \( T \) (in °F) and the wind speed \( W \) (in miles per hour) have been recorded at various times \( h \), where \( h \) is measured in hours after 8 a.m. on October 10.

<table>
<thead>
<tr>
<th>( h )</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>( B )</td>
<td>10</td>
<td>11</td>
<td>15</td>
<td>13</td>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>( T )</td>
<td>30</td>
<td>33</td>
<td>40</td>
<td>39</td>
<td>33</td>
<td>31</td>
</tr>
<tr>
<td>( W )</td>
<td>14</td>
<td>10</td>
<td>13</td>
<td>12</td>
<td>11</td>
<td>10</td>
</tr>
</tbody>
</table>

Based on the table above, which of the following statements could be true about \( h \), \( B \), \( T \) and \( W \)? **Circle all that apply.**

- \( B \) is a function of \( T \)
- \( T \) is a function of \( B \)
- \( W \) is a function of \( B \)
- \( B \) is a function of \( W \)
- \( h \) is a function of \( T \)
- \( W \) is a function of \( T \)