Quiz 14: Paired data
(taken on Wed May 17)

You may work with in a group of as many as three students on this quiz, handing in one quiz with all names, provided that you all contribute to the work. You may use your notes.

Researchers studied whether hormone levels tend to differ following days of strenuous activity as opposed to days of no strenuous activity. For each of six subjects, one blood sample was taken after a day in which the person engaged in strenuous exercise, and one blood sample was taken after a day that included no strenuous activity. The data on growth hormone levels (in mg/ml) follow, along with some summary statistics:

<table>
<thead>
<tr>
<th>Subject</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hormone level (after strenuous exercise)</td>
<td>13.6</td>
<td>14.7</td>
<td>42.8</td>
<td>20.0</td>
<td>19.2</td>
<td>17.3</td>
<td>21.27</td>
<td>10.84</td>
</tr>
<tr>
<td>Hormone level (after no strenuous activity)</td>
<td>8.5</td>
<td>12.6</td>
<td>21.6</td>
<td>19.4</td>
<td>14.7</td>
<td>13.6</td>
<td>15.07</td>
<td>4.75</td>
</tr>
<tr>
<td>Difference in hormone levels</td>
<td>5.1</td>
<td>2.1</td>
<td>21.2</td>
<td>0.6</td>
<td>4.5</td>
<td>3.7</td>
<td>6.20</td>
<td>7.53</td>
</tr>
</tbody>
</table>

1. Explain how the value 5.1 was calculated from other values in the table.

2. Calculate the value of the paired $t$-test statistic.

The p-value turns out to be .0998.

3. Summarize your test conclusion, using the .05 significance level.

For questions 4-5, suppose that subject #3 were removed from the analysis, in which case the value of the paired $t$-test statistic would become 3.89.

4. How many degrees of freedom would you use to calculate the p-value?

5. Which of the following best explains why removing subject #3 increases the value of the test statistic? (Do not bother to perform any calculations.)
   A. The smaller value of the mean
   B. The smaller value of the standard deviation
   C. The smaller value of the sample size