Use the information in the following setting to answer questions 1 through 3

In 1992 Hurricane Andrew struck Florida causing widespread devastation. The eye of Hurricane Andrew passed directly over a site where scientists were studying the ecology of white-tailed deer. The deer had been radio-collared prior to Andrew's appearance, and the hurricane provided an opportunity to study the effects of an awesome storm on the deer. The investigators felt that the home ranges of the deer would change, but were unsure of the direction of the change. (The home range is the average area an animal occupies while foraging for food and defending its territory.) Home ranges of animals usually do not change much unless an area is under ecological stress. Data for the home range (in hectares) for 12 randomly selected deer for both the pre-hurricane year of 1992 and the post hurricane year of 1993 were made available. Summary statistics for the difference in home range are given in Output 2, where the difference is calculated as 1993 Home Range – 1992 Home Range.

<table>
<thead>
<tr>
<th>Output 1: Descriptive Statistics for the deer home range study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Descriptive Statistics (difference)</td>
</tr>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>difference</td>
</tr>
</tbody>
</table>

1) Calculate a 95% confidence interval for the true difference in average deer home range. [5 pts]

\[
\begin{align*}
\text{df} &= 11 \\
\bar{x} &= 27.201 \\
C_{\alpha} &= 27.583 \pm 2.201(29.956) \\
&= (-38.3502, 93.5162)
\end{align*}
\]

2) Interpret your interval from Problem 1). [4 pts]

We are 95% confident that the true difference in average deer home range following Hurricane Andrew is between -38.3502 and 93.5162 hectares.

3) Based on your confidence interval, can you conclude that the investigators were correct in their belief that the home ranges of the deer changed following Hurricane Andrew? Justify your answer. [3 pts]

We cannot, as 0 is contained in our confidence interval suggesting that there might be no change.
Use the information in the following setting to answer questions 4 and 5:
Researchers are interested in determining if a weight loss drug is effective. 17 people were selected to partake in their study. Their initial weights were recorded and after 6 weeks, they were weighed once again. Descriptive statistics for the difference in weight (in pounds) are given in Output 1 below, where the difference was recorded as Initial Weight – Weight After 6 Weeks.

<table>
<thead>
<tr>
<th>Output 1: Descriptive Statistics for the weight loss drug study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Descriptive Statistics (difference)</strong></td>
</tr>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>difference</td>
</tr>
</tbody>
</table>

4) Using a 0.05 significance level, perform a hypothesis test to see if the weight loss drug is effective.

**Step 1**

\[ H_0: \mu_d = 0 \]
\[ H_1: \mu_d > 0 \]

**Step 2**

\[ \alpha = .05 \]

**Step 3**

\[ n = 17 < 30 \times \text{Assumption violated} \]

Independent observations ✓

Random sample ✓

Continue with the rest of the hypothesis test even if the assumptions do not hold.

**Step 4**

\[ t_{test} = \frac{3.353}{4.554/\sqrt{17}} = 3.0357 \]

**Step 5**

\[ p-value = P(t_{16} > 3.0357) \]

\[ p-value = 0.00393 \text{ if exact} \]

\[ p-value = 0.005 \text{ if approx.} \]
Step 6

Reject \( H_0 \) since \( p\)-value < \( \alpha \)

[2 pts]

Step 7

We have enough evidence at the .05 level to conclude that the weight loss drug is effective on average.

[4 pts]

5) Suppose the weight loss drug will only go to market if it provides, on average, weight loss of at least 3 pounds. What hypotheses would the researchers need to test in this case? (You don’t need to test them, just state them.)

\[ H_0 : \mu_d \leq 3 \]

\[ H_A : \mu_d > 3 \]

[2 pts]

6) Consider a hypothesis setting of the following type: \( H_0 : \theta = c \) versus \( H_a : \theta \neq c \). Here \( \theta \) represents a general parameter (anything you want it to be like \( \mu \), maybe) and "c" is some generalized hypothesized value. Let \( \alpha = 0.05 \). Further, let the test statistic be a positive value but not large enough so that \( H_0 \) is rejected. From the choices below, which of the following could be the P-value? (Circle all that apply)

A) 0.015
B) 0.030
C) 0.045
D) 0.065
E) 0.075
F) 0.078

[3 pts]