1. In a random sample of 100 male college students, 62 watched at least part of the NCAA basketball championship game. to be defective.

   (a) Find a 98 % confidence interval for the proportion of all male college students watched.

   (b) For part a), you will need the tabled value 2.33. Specify how you would obtain this value.

2. An environmentalist wants to establish that the mean length of pine needles, for one species growing along the Wisconsin river, is different from 5.9 centimeters. A sample of 16 needles, from sixteen different trees, provided the data $\bar{x} = 5.3$ and $s = 1.2$ cm. Assume the distribution of needle length is normal.

   (a) Formulate the null and alternative hypotheses. (Define any symbols you use.)

   (b) Determine the test statistic.

   (c) Give the form of the rejection region.

   (d) What is the conclusion to your test? Take $\alpha = .10$. You will need the tabled value 1.753.

   (e) What error could you have committed when you reached your decision in Part d.

3. Let $X_1, X_2, ..., X_n$ be a random sample of size $n$ from the negative exponential distribution having probability density function

   \[ \frac{1}{\theta} e^{-\frac{x}{\theta}} \quad \text{for} \quad x > 0. \]

   Obtain the likelihood ratio test statistic for testing $H_0 : \theta = 2$ versus $H_1 : \theta \neq 2$.

4. Let $X_1, ..., X_6$ be a random sample of size 6 from a normal distribution having mean 0 and variance 2.

   (a) Determine the distribution of

   \[ \frac{\sum_{i=2}^{5} X_i^2}{2} \]
(b) Determine the distribution of
\[ \frac{X_1 + X_6}{\sqrt{\frac{\sum_{i=2}^{5} X_i^2}{2}}} \]

Explain your steps carefully.

5. A sunglass company’s marketing department wants to compare two types of lenses, the current lens \( A \) and one made of a new hi-tech material \( B \). Five glasses are made of each material and a sample of 5 persons is asked to wear one of each for a whole day. After a day in the sun, they are asked to score the pair of sun glasses on a scale of 1 to 9 with higher scores being best.

<table>
<thead>
<tr>
<th>Person No.</th>
<th>Lens A</th>
<th>Lens B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

(a) Find a 95 % confidence interval for the mean difference in ratings of the lenses.
(b) How would you randomize in this experiment?
(c) Would you inform the participant which pair of glasses was made of the hi-tech material? Explain your answer.