1. **Hedonic prices.**

Table 1 presents the prices of properties of four types of houses:

<table>
<thead>
<tr>
<th>Type of house</th>
<th>Price (dollars)</th>
<th>View</th>
<th>Indoor space (square feet)</th>
<th>Outdoor space (square feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>300,000</td>
<td>No</td>
<td>1,000</td>
<td>2,000</td>
</tr>
<tr>
<td>2</td>
<td>500,000</td>
<td>No</td>
<td>1,500</td>
<td>7,000</td>
</tr>
<tr>
<td>3</td>
<td>360,000</td>
<td>Yes</td>
<td>1,800</td>
<td>2,000</td>
</tr>
<tr>
<td>4</td>
<td>600,000</td>
<td>Yes</td>
<td>1,200</td>
<td>4,000</td>
</tr>
</tbody>
</table>

a. Derive from these prices and properties the implicit price of indoor and outdoor space at locations with and without a view.

b. What is the gain from a view for a proposed house with indoor space of 1,000 square feet and outdoor space of 1,500 square feet?

Give short answers to the following questions:

c. Is willingness to pay for environmental amenity greater than the willingness to accept? Why?

d. What is a contingent valuation technique? Identify one of its weaknesses.

2. **Prior appropriation rights.** The demand for water with prior appropriation rights is:

\[ P = 10 - X \]

where pumping costs is zero, prior approximation price is zero, and \( X = 10 \).

The demand of people with junior rights and no access to water under the prior appropriation system is

\[ P = 12 - 1.2X. \]
i. Suppose only 10 units of water are available.
   a. What will happen if water trading is introduced?
   b. What will be the price of water?
   c. If the senior right owners sell the water, what will be their welfare gain?
   d. What will be the gain of the junior rights owner?

ii. Suppose that the reform introduces trading but restricts availability to 9 units.
   a. What will be the price of water?
   b. What will be the welfare effect?

iii. What may be the problem associated with implementing water trading?

3. **Drainage.** A region has a drainage problem. The demand for water with traditional technology is

\[
P = 14 - 2X_0,
\]

where \( X_0 \) is applied water and water-use efficiency is .5. The demand for water with modern irrigation is \( 18 - 3X \), where \( X_1 \) is applied water and water-use efficiency equals 1.

   a. If the price of water is $2/AF and the cost of modern irrigation is $10, which technology will be adopted and how much will be used?
   b. If the price per unit of drainage is $10, which technology will be adopted? How much water will be needed? Now suppose abatement is available, and it cost $4 per unit of drainage. How will it affect your answer to b?

4. **Food security.** The risk of a disease is \( R = .0001XZ \cdot D \)

where \( X \) is level of input disposal to a river.

\( Z = .1 \) of bottled water consumed; 1 otherwise.

\( Z \) – exposure variable and

\( D = \) dose/response coefficient.

\[
d = 5 \text{ for a vulnerable person (children and the elderly)}
\]
i. A city has 1,000 healthy people and 2,000 vulnerable ones. Industry profit is $20\sqrt{X} - 5X$.

a. What is the distribution of risk with the population if $X$ is produced by a profit-maximizing firm and no bottled water is used?

b. What will happen to risk distribution if all people use bottled water?