Question #1 (100 Points)
Consider the following normal form game:

<table>
<thead>
<tr>
<th></th>
<th>Lacey</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Recycle</td>
<td>No Recycle</td>
</tr>
<tr>
<td>Recycle</td>
<td>(15,15)</td>
<td>(0,10)</td>
</tr>
<tr>
<td>No Recycle</td>
<td>(10,0)</td>
<td>(5,5)</td>
</tr>
</tbody>
</table>

a) Construct a story that explains the payoffs of the above game (15 Points)
b) Identify the Nash equilibria of the normal form game. (35 Points)
c) Solve the extensive form game assuming that Jessica is the first mover. Explain formally and intuitively how your results change if the first mover of the game is Lacey. (50 Points)

Solution

a) If both players cooperate (Recycle, Recycle) their payoff is greater than in the non-cooperative case. It can be explained by the fact that when both players decide to recycle their actions generate a higher environmental quality. Note that if both players do not cooperate their total payoff is lower but still positive. It can be explained by the saved opportunity cost from not recycling. Finally, if only one player recycles, then her payoff is zero, since despite the fact the environmental quality increases she has to incur a cost from recycling. In addition, the other player obtains a strictly positive payoff (10), since she benefits from the other players action (recycling), that is, she enjoys an improved environmental quality and her cost is zero (since she decided not to recycle, this is due to the free-riding behavior). [3 points]

b) The Nash equilibria of this game are {Recycle, Recycle} and {No Recycle, No Recycle}.

c) The Extensive form game is:

```
           Jessica
            /     \
         /       \
       /         \
  Lacey /             \
         /               \
       /                 \
  R     /                   \
         /                     \
   /                       \
   /                         \
  NR  /                     \
     /                       \
   /                         \
  R   /                   \
     /                     \
   /                       \
  NR  /                 \
     /                   \
   /                     \
  Lacey /               \
         /             \
       /               \
   /                 \
  NR  /               \
     /             \
   /               \
  R     /         \
        /       \
    (15,15) /     \
     /         \
   (0,10) /       \
     /         \
   (10,0) /       \
     /         \
   (5,5) /     ```
The Nash equilibrium of the extensive form game is \{(Recycle, Recycle)\}

d) The extensive form game is:

The Nash equilibrium of the extensive form game is \{(Recycle, Recycle)\}