1. Consider the following game:

<table>
<thead>
<tr>
<th></th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>4,2</td>
<td>1,1</td>
<td>0,0</td>
<td>0,-1</td>
</tr>
<tr>
<td>M</td>
<td>1,1</td>
<td>2,4</td>
<td>1,1.5</td>
<td>0,-5</td>
</tr>
<tr>
<td>B</td>
<td>0,0</td>
<td>0,1</td>
<td>0,2</td>
<td>5,-3</td>
</tr>
</tbody>
</table>

Find all the Nash equilibria (pure and mixed) of the game.

2. A crime is observed by \( N \) people. Each would like the crime to be reported, but reporting the crime is costly. If the crime gets reported to the police (by at least one person), each gets a value of \( v \). If a person reports the crime, he bears the cost of \( c \), with \( v > c > 0 \). If the crime is not reported, each receives a value of zero. Each of the people decides simultaneously whether or not to report the crime.

(a) Formulate a strategic game that captures the above situation, and find all its pure strategy NE.

(b) Find the symmetric mixed strategy NE of the game.

3. MWG, 8.E.1, 8.E.3. In both questions, also write out the elements of the Bayesian game (i.e., players, action sets, type space, etc.).

4. Consider an auction with two bidders. Bidder \( i \)'s valuation of the object is given by

\[
v_i = s_i + \frac{1}{2}s_j,
\]

for \( i, j = 1, 2 \). Bidder \( i \) (respectively \( j \)) knows the value of \( s_i \) (respectively \( s_j \)), but not the value of \( s_j \) (respectively \( s_i \)). However, it is common knowledge that \( s_i \) and \( s_j \) are i.i.d. uniform on \([0, 1]\).

The auction format is first price sealed bid auction.

(a) Write out the Bayesian game for the auction setting.

(b) Solve for the symmetric, increasing, and differentiable Bayesian equilibrium of the game.