620-361 Operations Research Techniques and Algorithms

Practice Class 2

**PROBLEM 1.** For each of the following matrices state whether it is positive definite, negative definite, or neither:

(a) \[
\begin{pmatrix}
1 & 2 \\
2 & 1
\end{pmatrix}
\]

(b) \[
\begin{pmatrix}
7 & \sqrt{3} \\
\sqrt{3} & 1
\end{pmatrix}
\]

(c) \[
\begin{pmatrix}
1 & 1 \\
1 & 1
\end{pmatrix}
\]

(d) \[
\begin{pmatrix}
1 & 0 & 0 \\
0 & 2 & 0 \\
0 & 0 & 1
\end{pmatrix}
\]

**PROBLEM 2.** A retailer is planning her yearly inventory strategy for a commodity for which the demand rate is \( D \) units per year. The storage cost is \( S \) per unit and the fixed cost of placing an order is \( C \) dollars. Customers will accept shortages, and the cost of maintaining a list of backorders is \( B < S \). Let \( x \) be the order amount and \( y \) the maximum shortage inventory prior to ordering. Find the optimal value of \( x \) and \( y \).

**PROBLEM 3.** Problem 5(b) and 5(d) of Collected exercises (Lecture Notes).