Assignment 2

Problem 1: Find the characteristic equation of the matrix below:

\[
\begin{pmatrix}
0 & 1 \\
-2 & 3
\end{pmatrix}
\]

Problem 2: Consider the following system of equations:

\[
\begin{align*}
2x + 3y &= 8 \\
4x - y &= 5
\end{align*}
\]

Problem 3: A cylindrical tank has a radius of 5 meters and a height of 10 meters. Water is being pumped into the tank at a rate of 10 cubic meters per minute. Water leaks out of the tank at a rate of 2 cubic meters per minute.

a) How long will it take to fill the tank?

b) What will be the height of the water in the tank after 30 minutes?

Problem 4: A company manufactures two products, A and B. The profit from product A is $5 per unit and from product B is $7 per unit. The company has 100 hours of labor and 200 units of materials available per week. Each unit of product A requires 2 hours of labor and 1 unit of material, while each unit of product B requires 3 hours of labor and 2 units of material.

a) How many units of each product should the company produce to maximize profit?

b) What is the maximum possible profit?