

A list of formulas: $I = Prt$; $A = P(1 + rt)$

$$A = P(1 + i)^n; APY = (1 + \frac{r}{m})^m - 1$$

$$FV = PMT \frac{(1+i)^n - 1}{i}, \text{ where } i = \frac{r}{m} \text{ and } n = mt$$

$$PV = PMT \frac{1 - (1+i)^{-n}}{i}$$

1. a) (5 points) How long does it take an investment of 1200 YTL to exceed 2500 YTL, if compounded quarterly at 11.8% ?

b) (5 points) A bank account is compounded quarterly. What is the annual nominal interest rate, if the account grows 50% in 6 months?

2. A couple receive \$1720 per month for 23 years from their investment account, which is compounded monthly at 10.6%.

a) (6 points) Before any withdrawal, they had invested money into the same account for 32 years. How much did they deposit per month?

b) (5 points) What is the interest they received from the account in 55 years?

c) (4 points) At what point in time did they have the highest amount of money in the account ? How much was it ?

d) (5 points) How much money remained in the account 4 years after they started withdrawing money?

3. a) (10 points) Solve the following system using Gauss-Jordan elimination.

$$\begin{aligned}2x_1 - x_2 + 2x_3 - x_4 &= 5 \\-3x_2 - 3x_4 &= 3 \\x_1 + x_3 + x_4 &= 4\end{aligned}$$

b) (5 points) Reduce the following augmented matrix. Write the linear system corresponding to it and solve. Is the system consistent or not? Does the solution set have one, many or no elements? Is the system dependent or independent?

$$\left[\begin{array}{ccc|c} 1 & 0 & 1 & 2 \\ -1 & 0 & -1 & -1 \\ 2 & 0 & 2 & 4 \end{array} \right]$$

4. a) (10 points) Find the inverse of $M = \begin{bmatrix} 1 & 0 & -1 \\ -1 & 1 & 0 \\ 2 & 1 & 3 \end{bmatrix}$, if it exists.

b) (10 points) Solve the following system using inverse matrix method.

$$\begin{aligned}x_1 - x_3 &= 0 \\ -x_1 + x_2 &= 1 \\ 2x_1 + x_2 + 3x_3 &= 7\end{aligned}$$

5. a) (5 points) Formulate the following problem as a linear programming problem (DO NOT SOLVE THE SYSTEM)

A company produces two special wines, a white and a red. A bottle of white wine requires 14 pounds of grapes and 1 hour of processing time. A bottle of red wine requires 25 pounds of grapes and 2 hours of processing time. The company has on hand 2000 pounds of grapes and can spend 160 hours processing time in the production of these wines. A bottle of white wine sells for \$11, while a bottle of red wine sells for \$20. How many bottles of each type should the company produce in order to maximize total sales?

Solve the following linear programming problem

Maximize $2x_1 + 6x_2$
subject to

$$\begin{aligned}5x_1 + 2x_2 &\leq 40 \\x_1 + 3x_2 &\leq 21 \\-2x_1 + 3x_2 &\leq 12 \\x_1 \geq 0, x_2 &\geq 0\end{aligned}$$

b) (15 points) by using the geometric approach,

c) (15 points) by using the Simplex method.