

There are 11 questions on this exam. Answer all questions! Show all work! Little or no credit will be given for unsupported answers.

You MUST show all formulas that you use! Show all values when using TVM Solver and syntax when using TVM variables.

Problem	Score
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

(1) [10 pts] Solve this system of equations:

$$\begin{array}{rclcl} x & -y & -2z & = & 2 \\ & y & -2z & = & 1 \\ -3x & -2y & -8z & = & 7 \end{array}$$

(2) [10 pts] A simple economy consists of two industries, oil and steel. The oil industry consumes \$.06 worth of oil and \$.10 worth of steel to produce \$1 of oil. The steel industry consumes \$.20 of oil and \$.15 worth of steel to produce \$1 of steel.

(a) What is the Input-Output matrix for this economy?

(b) At what level should each industry produce in order to have \$18 million of oil and \$23 million of steel available for export?

(3) [10 pts] Of 130 students who came to math class, 90 were wearing boots, 62 were wearing a hat, and 50 were wearing both boots and a hat.

(a) Draw a Venn diagram that can be used to represent this situation.

(b) How many students were wearing boots or a hat?

(c) How many students did not wear boots or a hat?

(d) How many students wore boots, but not a hat?

(e) How many students were wearing boots or hats but not both?

(4) [5 pts] How many 4 letter words (including nonsense words) can be made from the letters G, O, P, H, E, R if words must end in a vowel and letters cannot be repeated?

(5) [10 pts] An urn contains 6 red marbles and 4 green marbles. A sample of 7 marbles is selected at random. What is the probability that exactly 4 red marbles are selected?

(6) [10 pts] The table below shows the number of crimes reported by location and by the type of crime.

	Robbery	Murder	Assault
Residential	130	40	30
Commercial	102	28	20

(a) What is the probability that a randomly selected crime reported in a residential district is a murder?

(b) What is the probability that a randomly selected crime was committed in a commercial area given that it was an assault?

(7) [10 pts] An automobile tire manufacturer guarantees its tires for 60000 miles. Tests have shown that tires have a life which is normally distributed, with an average life of 70000 miles and a standard deviation of 8000 miles. What percentage of the tires will be returned to the company while under warranty? Support your answer with a graph!

(8) [5 pts] A die is tossed 6 times. What is the probability that a one appears exactly 4 times?

(9) [10 pts] Jesse saves \$100 each month in a fund that pays 5.4% compounded monthly. What will be her balance after 25 years?

How much interest will she have earned in that time?

(10) [10 pts] To start up his new business, Henri has borrowed \$180,000 at 7% interest compounded monthly, to be paid monthly for 15 years.

What is his monthly payment?

What is the balance on the loan at the end of 10 years?

(11) [10 pts] You make a deposit of \$15000 in an account earning 6% compounded monthly. Each month you withdraw \$150.

Write a difference equation showing the balance, y_n , at the end of each month.

What is the balance at the end of 10 months?

What is the *minimum* initial deposit you would need to make so that you could withdraw \$150 per month forever?

Summary of Finance Formulas

Compound Interest

$$F = P \cdot (1 + i)^n$$

$$P = F \cdot (1 + i)^{-n}$$

Annuities and Sinking Funds: Future Value

$$F = R \cdot \left[\frac{(1 + i)^n - 1}{i} \right]$$

$$R = F \cdot \frac{i}{(1 + i)^n - 1}$$

Annuities: Present Value

$$P = R \cdot \left[\frac{1 - (1 + i)^{-n}}{i} \right]$$

$$R = P \cdot \left[\frac{i}{1 - (1 + i)^{-n}} \right]$$