

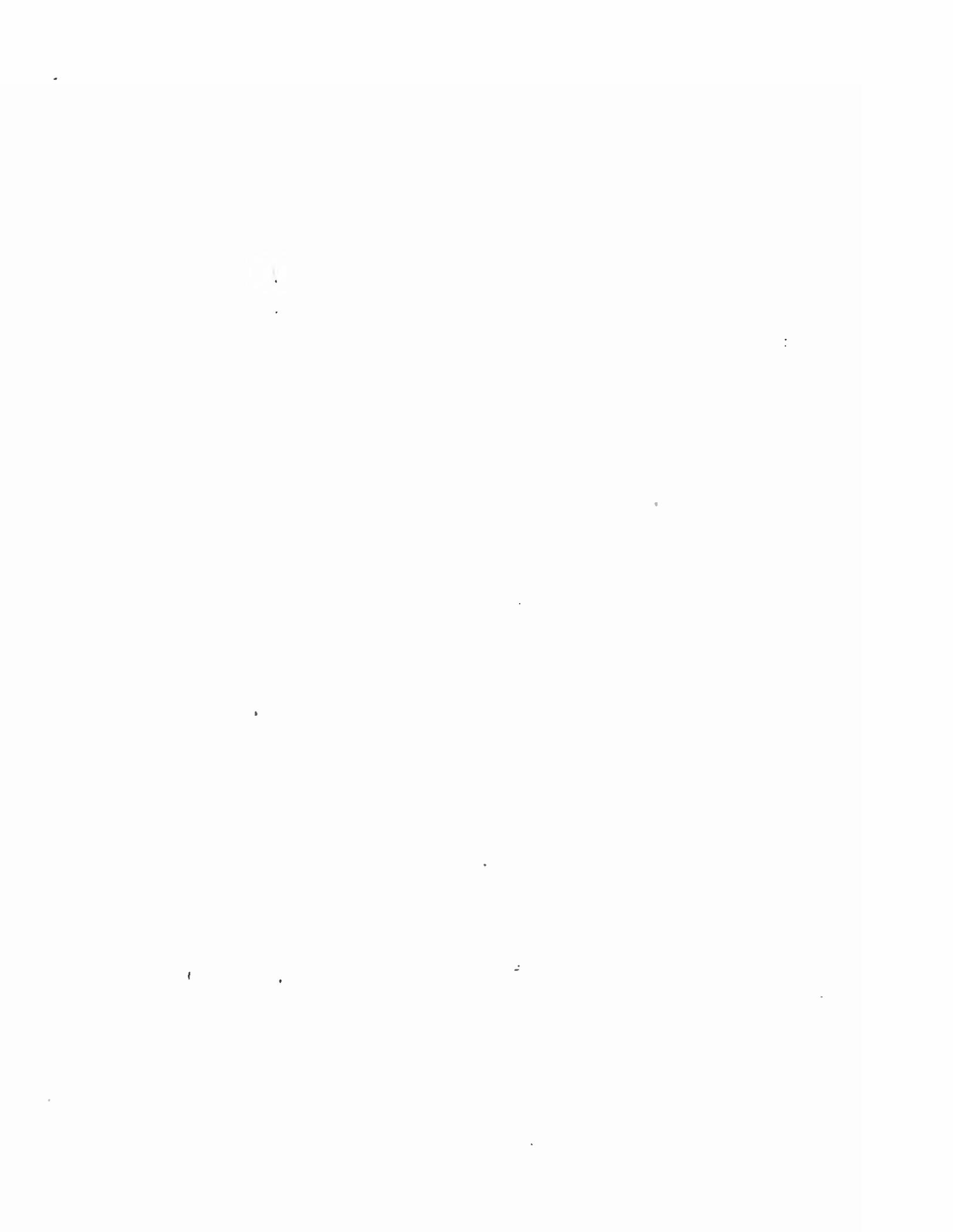
CHAPTER 6

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CHAPTER VI - INTEREST AND ANNUITY PROBLEMS

INTRODUCTION

This chapter contains interest and annuity problems which illustrate the principles and procedures previously discussed. Once you have worked through this chapter you should have a very good understanding of how to approach an economic evaluation of resource problems in your district.



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Service

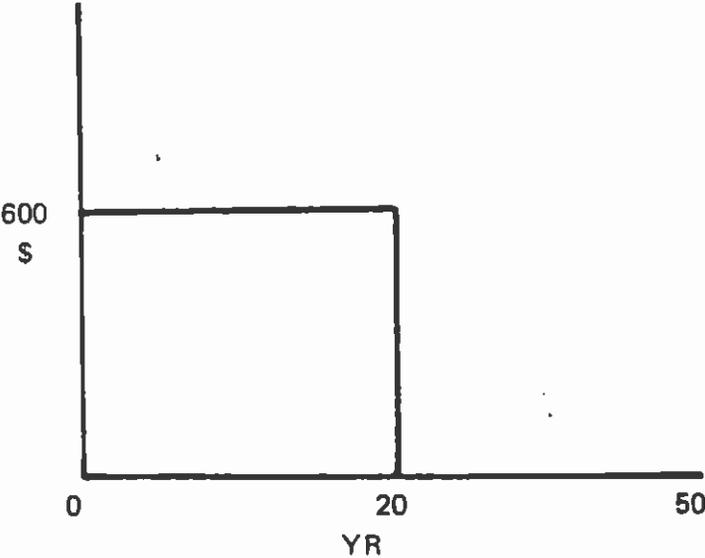


ECONOMICS— Soil and Water Conservation

Interest and Annuity

Example Problems and
Solutions

RECEIVE \$600 PER YEAR FOR 20 YEARS. FIND AVERAGE ANNUAL VALUE OVER A 50 YEAR EVALUATION PERIOD AT 8%.



RECEIVE \$600 PER YEAR FOR 20 YEARS. FIND AVERAGE ANNUAL VALUE OVER A 50 YEAR EVALUATION PERIOD AT 8%.

PRINCIPLES

1. PV OF AN ANNUITY

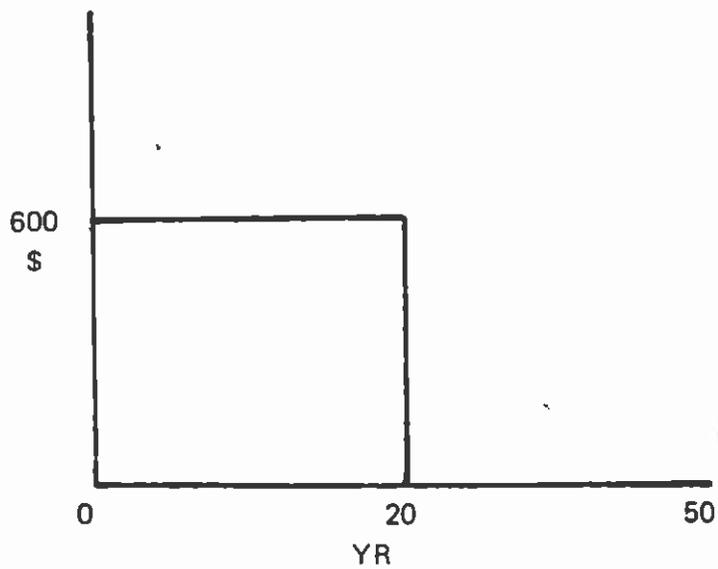
2. AVE. ANN. VALUE (AMORTIZATION)

(PV OF ANN. OF 1 – 20 YR – 8%) (600)

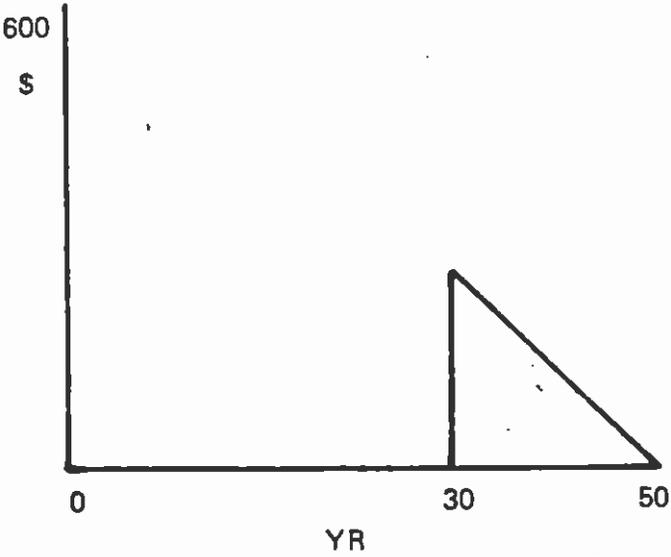
$$= (9.81815) (600) = 5890.89$$

(AMORT. – 50 YR – 8%) (5890.89)

$$= (.08174) (5890.89) = 481.52/\text{YR}$$



AFTER YEAR 30 A RETURN OF \$600 WILL DECREASE TO 0 IN YEAR 50. FIND THE AVERAGE ANNUAL VALUE FOR A 50 YEAR EVALUATION PERIOD AT 8%.



AFTER YEAR 30 A RETURN OF \$600 WILL DECREASE TO 0 IN YEAR 50. FIND THE AVERAGE ANNUAL VALUE FOR A 50 YEAR EVALUATION PERIOD AT 8%.

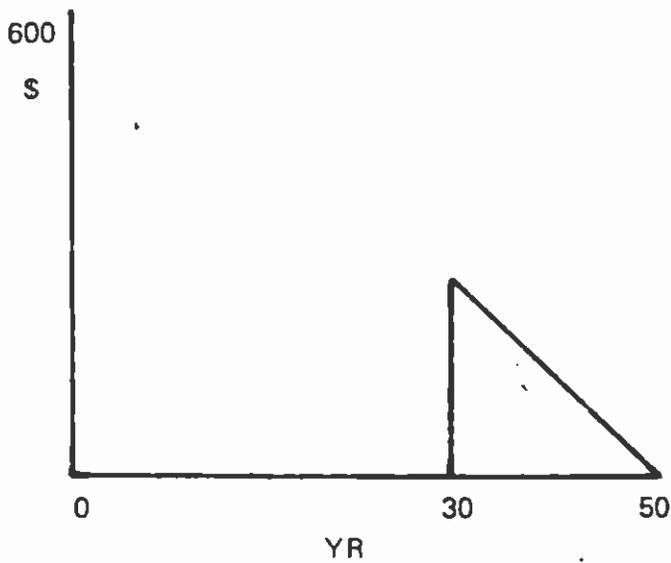
PRINCIPLES

PV OF DEC ANN

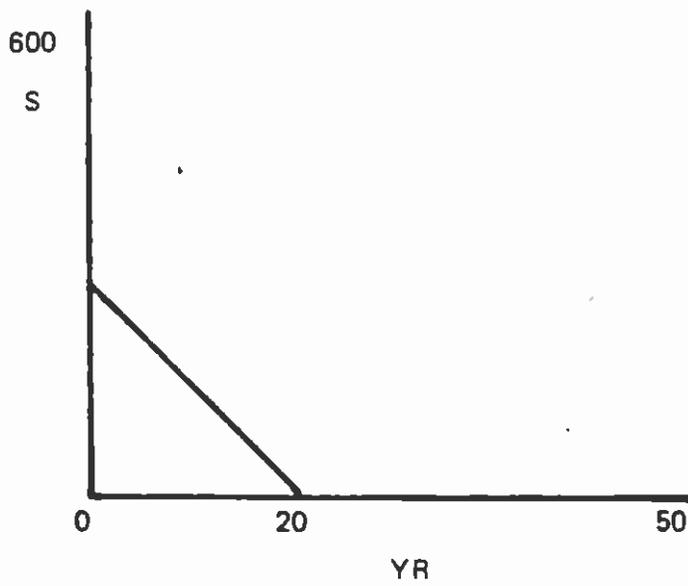
PV OF 1

AMORT.

(PV OF DEC ANN – 20 – 8%)	$\left[\frac{600}{20} \right]$	
(127.27316) (30)		= 3818.19
(PV OF 1 – 30 – 8%) (3818.19)		
(.09938) (3818.19)		= 379.45
(AMORT. – 50 – 8%) (379.45)		
(.08174) (379.45)		= 31.02



A PRESENT RETURN WILL DECREASE FROM \$600 TO 0 IN YEAR 20. FIND THE AVERAGE ANNUAL VALUE FOR A 50 YEAR EVALUATION PERIOD AT 8%.



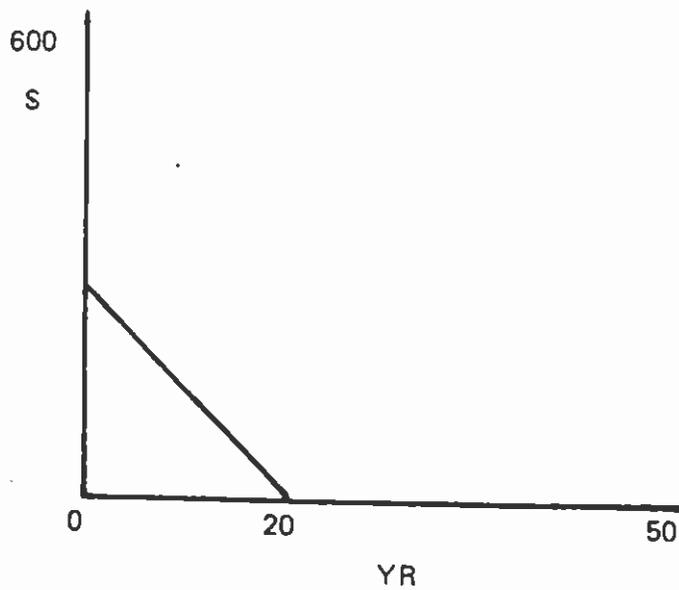
A PRESENT RETURN WILL DECREASE FROM \$600 TO 0 IN YEAR 20. FIND THE AVERAGE ANNUAL VALUE FOR A 50 YEAR EVALUATION PERIOD AT 8%.

PRINCIPLES

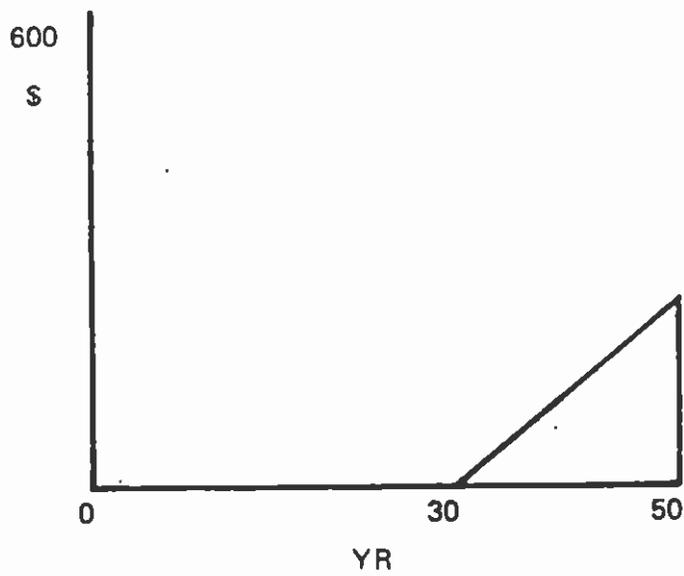
1. PV OF DEC. ANN.

2. AMORT

$$\begin{aligned}
 & (\text{PV OF DEC. ANN.} - 20 - 8\%) \left[\begin{array}{c} 600 \\ 20 \end{array} \right] \\
 = & (127.27316) (30) & = 3818.19 \\
 & (\text{AMORT} - 50 - 8\%) (3818.19) \\
 & (.08174) (3818.19) & = 312.10
 \end{aligned}$$



A RETURN WILL BUILD FROM 0 IN YEAR 30 TO \$600 IN YEAR 50. FIND THE AVERAGE ANNUAL VALUE AT 8% FOR A 50 YEAR EVALUATION PERIOD.

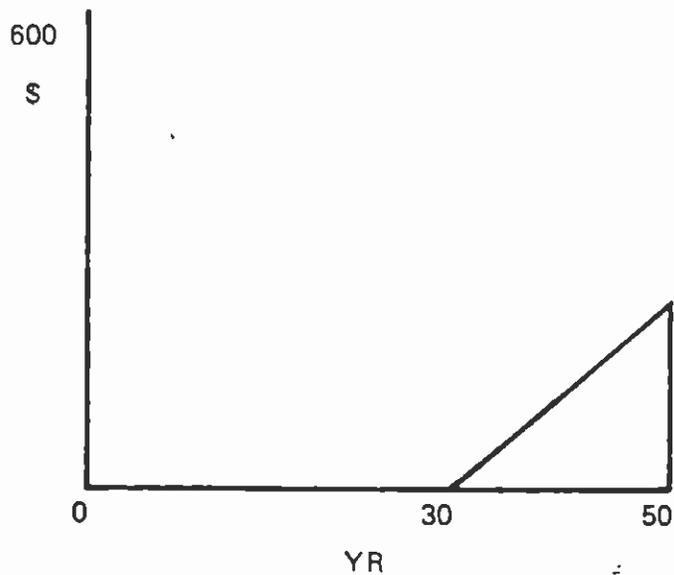


A RETURN WILL BUILD FROM 0 IN YEAR 30 TO \$600 IN YEAR 50. FIND THE AVERAGE ANNUAL VALUE AT 8% FOR A 50 YEAR EVALUATION PERIOD.

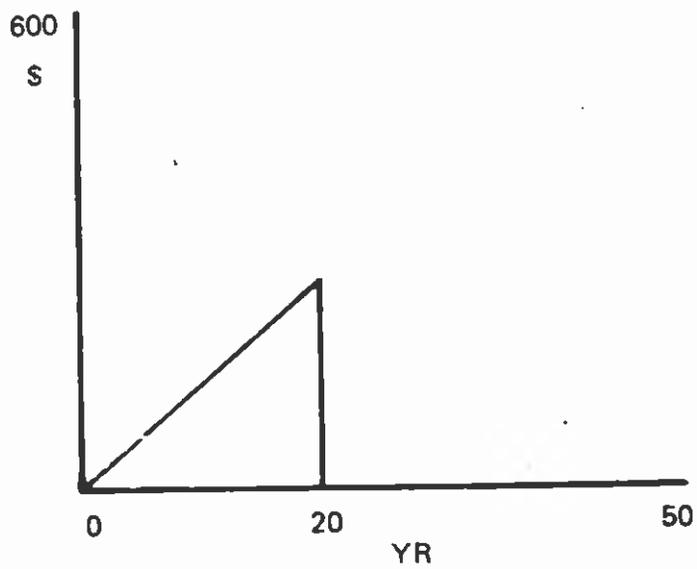
PRINCIPLES

- 1. PV OF INC ANN
- 2. PV OF 1
- 3. AMORT.

1. (PV OF INC ANN – 20 YR – 8%)	$\frac{600}{20}$	
(78.90794) (30)		= 2367.24
2. (PV OF 1 – 30 YR – 8%) (2367.24)		
(.09938) (2367.24)		= 235.26
3. (AMORT – 50 – 8%) (235.26)		
(.08174) (235.26)		= 19.23



A RETURN WILL BUILD FROM 0 TO \$600 IN 20 YEARS, THEN CEASE. FIND AVERAGE ANNUAL VALUE FOR A 50 YEAR EVALUATION PERIOD AT 8%.



A RETURN WILL BUILD FROM 0 TO \$600 IN 20 YEARS, THEN CEASE. FIND AVERAGE ANNUAL VALUE FOR A 50 YEAR EVALUATION PERIOD AT 8%.

PRINCIPLES

1. PV OF INC ANNUITY

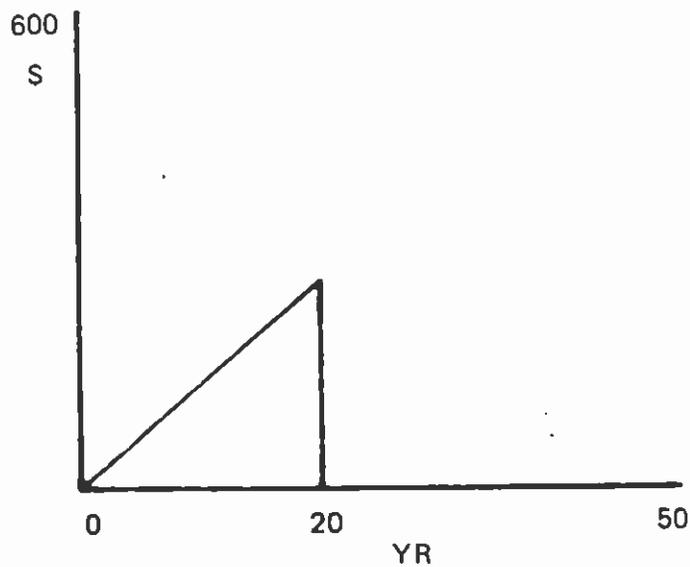
2. AMORT.

$$(PV \text{ OF INC ANN} - 20 \text{ YR} - 8\%) \left[\frac{600}{20} \right] = 2367.24$$

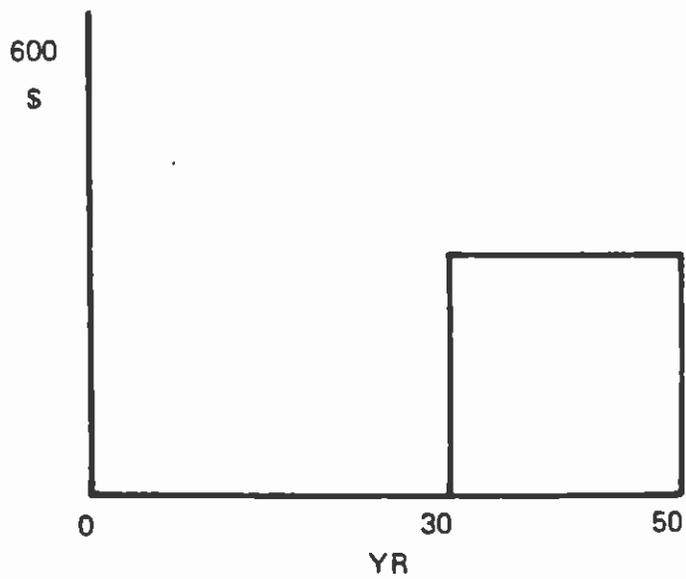
$$(78.90794) \left[\frac{600}{20} \right]$$

$$(AMORT - 50 - 8\%) (2367.24) = 193.50$$

$$(.08174) (2367.24)$$



RECEIVE \$600 PER YEAR FOR 20 YEARS BEGINNING IN YEAR 30. FIND AVERAGE ANNUAL VALUE OVER A 50 YEAR EVALUATION PERIOD AT 8%.

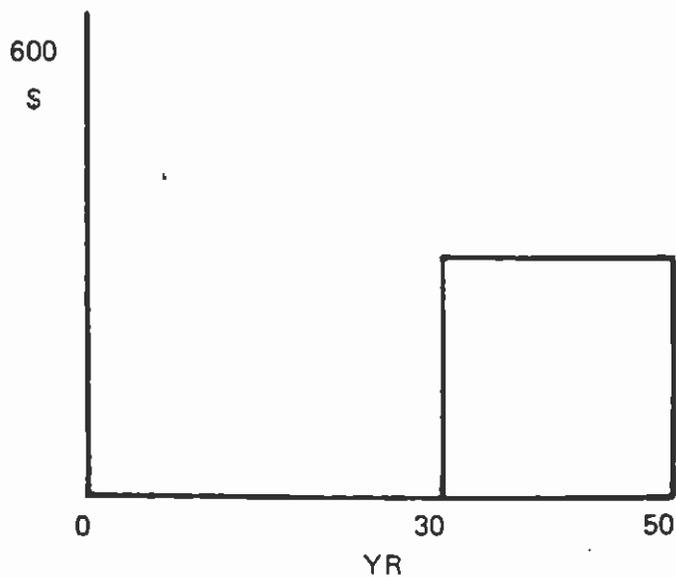


RECEIVE \$600 PER YEAR FOR 20 YEARS BEGINNING IN YEAR 30. FIND AVERAGE ANNUAL VALUE OVER A 50 YEAR EVALUATION PERIOD AT 8%.

PRINCIPLES

1. PV OF AN ANNUITY
2. PV OF 1
3. AMORT.

$$\begin{aligned} & (\text{PV OF ANN OF 1} - 20 \text{ YR} - 8\%) (600) \\ = & (9.8185) (600) & = & 5890.89 \\ & (\text{PV OF 1} - 30 \text{ YR} - 8\%) (5890.89) \\ = & (.09938) (5890.89) & = & 585.44 \\ & (\text{AMORT} - 50 \text{ YR} - 8\%) (585.44) \\ = & (.08174) (585.44) & = & 47.85 \end{aligned}$$



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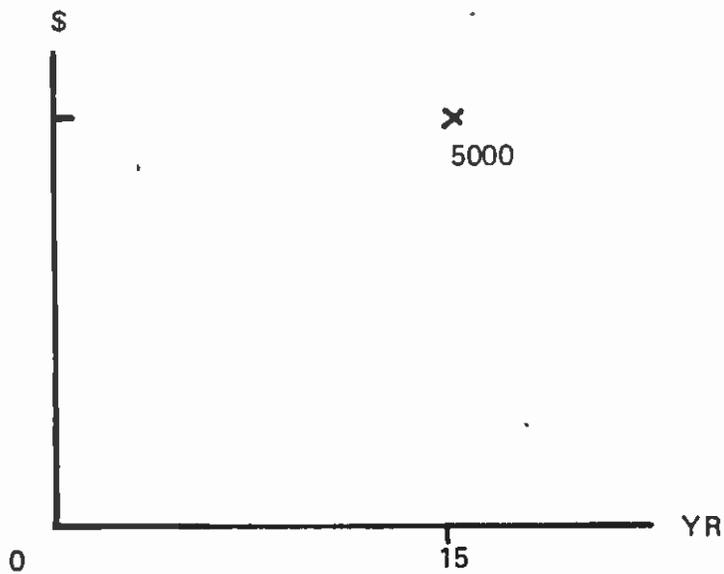
ECONOMICS— Soil and Water Conservation

Interest and Annuity

Exercises

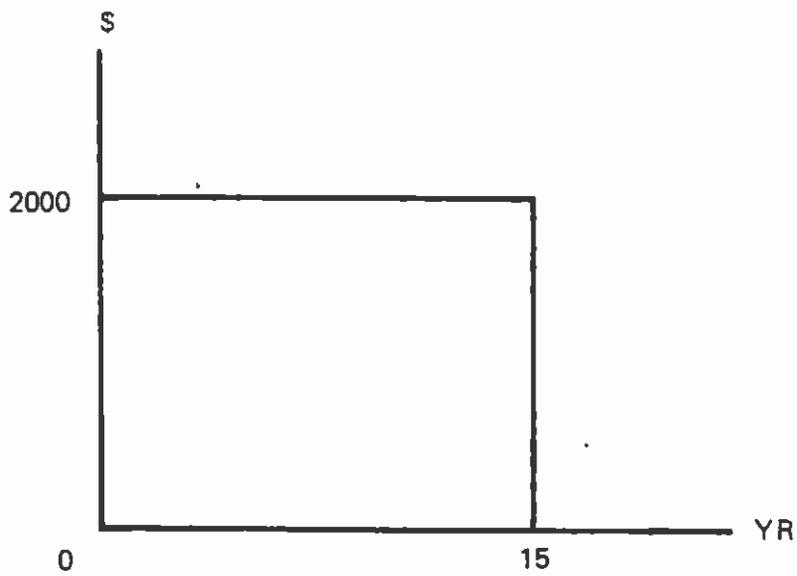
PROBLEM 1

FIND THE PRESENT VALUE OF RECEIVING \$5000 15 YEARS HENCE AT 10% INTEREST.



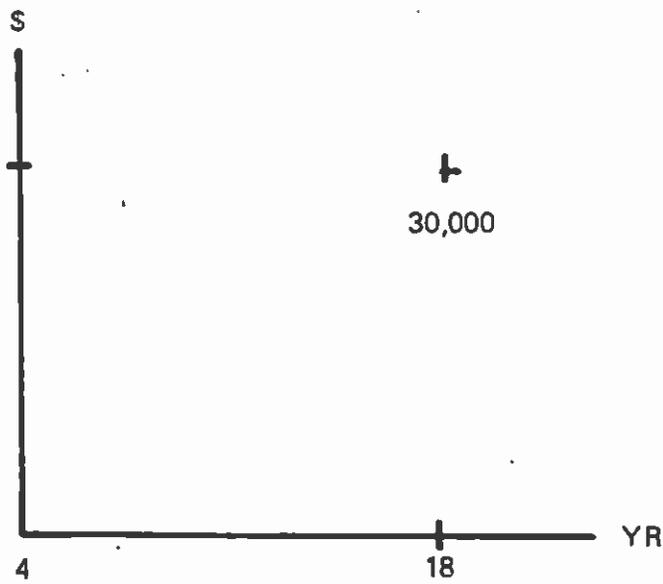
PROBLEM 2

FIND THE FUTURE VALUE OF PLACING \$2000 PER YEAR IN AN IRA AT 8% INTEREST FOR 15 YEARS.



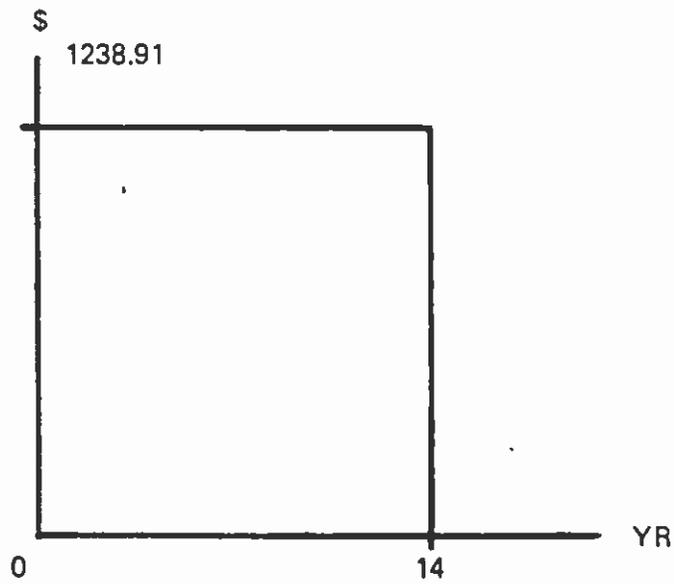
PROBLEM 3

YOUR SON IS 4 YEARS OLD. YOU ESTIMATE YOU WILL NEED \$30,000 FOR FOUR YEARS OF COLLEGE BEGINNING WHEN HE IS 18. HOW MUCH DO YOU HAVE TO PUT ASIDE EACH YEAR AT 8% INTEREST?



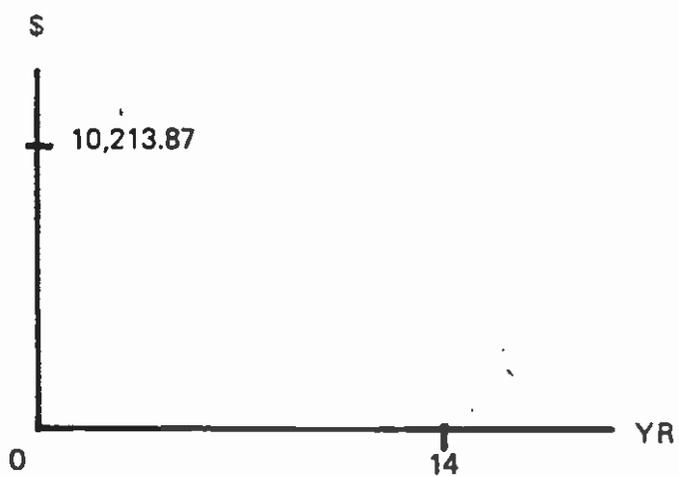
PROBLEM 4

FIND THE PRESENT VALUE OF PLACING \$1238.91 PER YEAR IN A SAVINGS ACCOUNT FOR 14 YEARS AT 8% INTEREST.



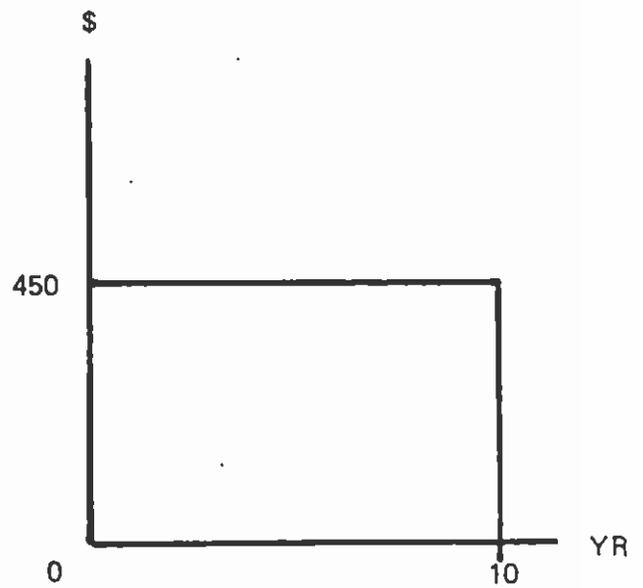
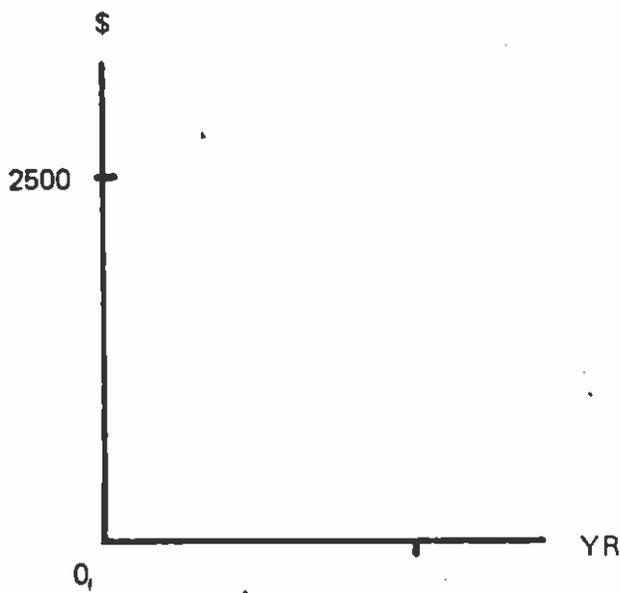
PROBLEM 5

REFER TO PROBLEM 4. WHAT IS THE FUTURE VALUE OF THAT AMOUNT?



PROBLEM 6

A FARMER IS CONSIDERING A TERRACE SYSTEM COSTING \$2,500. THE TERRACE SYSTEM WILL PERMIT HIM TO USE HIS LAND MORE INTENSIVELY. COST-RETURN BUDGETS INDICATE HE CAN INCREASE HIS NET RETURNS, EXCLUDING THE COST OF THE TERRACES, BY \$450 ANNUALLY. HE CAN OBTAIN A LOAN FOR 10 YEARS @ 10% INTEREST. HE WANTS TO EVALUATE THE FEASIBILITY OF INSTALLING THE TERRACE SYSTEM.

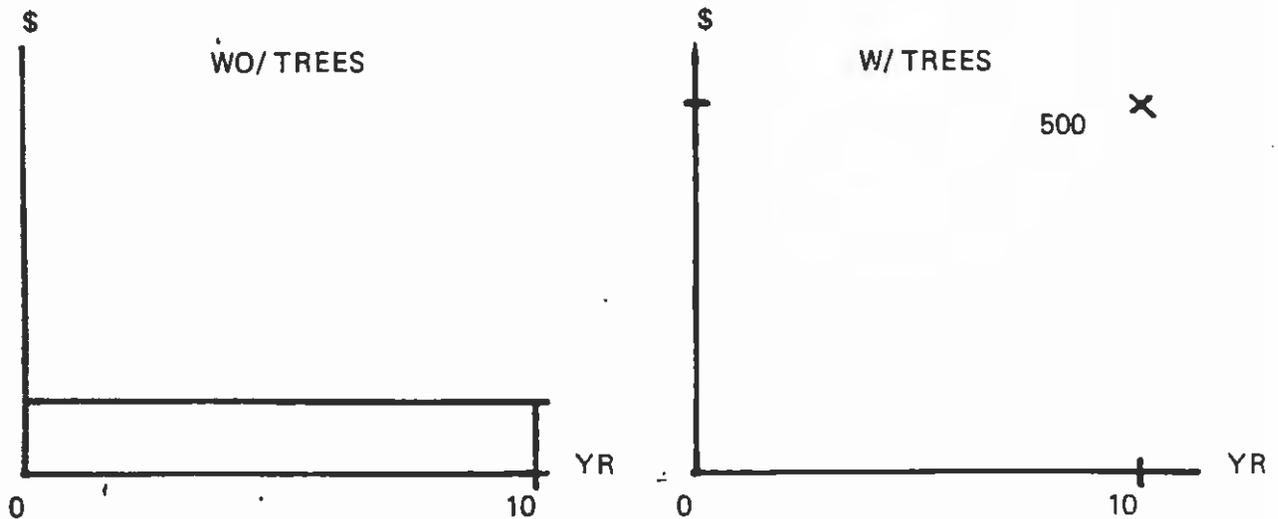


PROBLEM 7

SAME AS ABOVE EXCEPT IT IS ESTIMATED IN ADDITION TO THE COST OF INSTALLING THE TERRACE SYSTEM, IT WILL REQUIRE \$50 ANNUALLY TO MAINTAIN THEM. WHAT IS THE TOTAL ANNUAL COST AND BENEFIT.

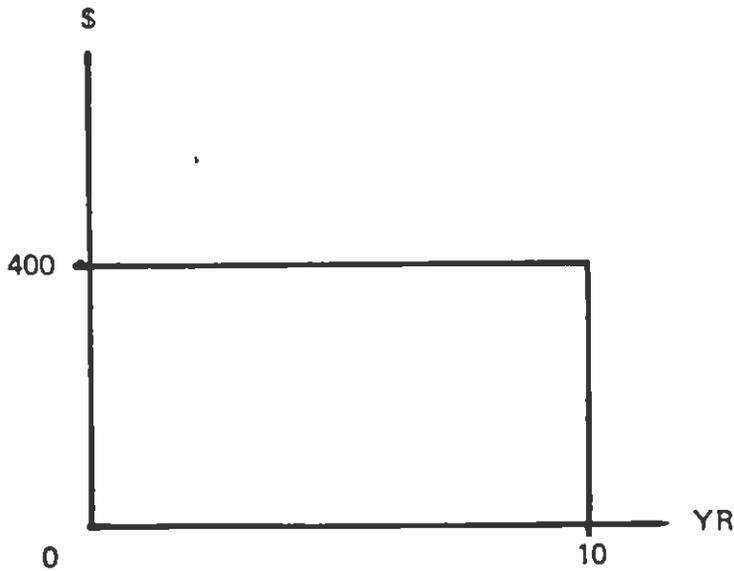
PROBLEM 8

A FARMER IS CONSIDERING PLANTING AN ACRE OF TREES FOR SALE AS CHRISTMAS TREES IT WILL TAKE 10 YEARS BEFORE THE TREES WILL BE OF MARKETABLE VALUE. AT THAT TIME A NET RETURN OF \$500 PER ACRE CAN BE EXPECTED. THE PRESENT NET RETURN ON THIS LAND IS \$30 PER ACRE. HOW CAN THESE TWO ALTERNATIVES BE EVALUATED SO THE FARMER CAN MAKE HIS DECISION? IT IS ASSUMED 10% INTEREST WILL BE APPLICABLE.



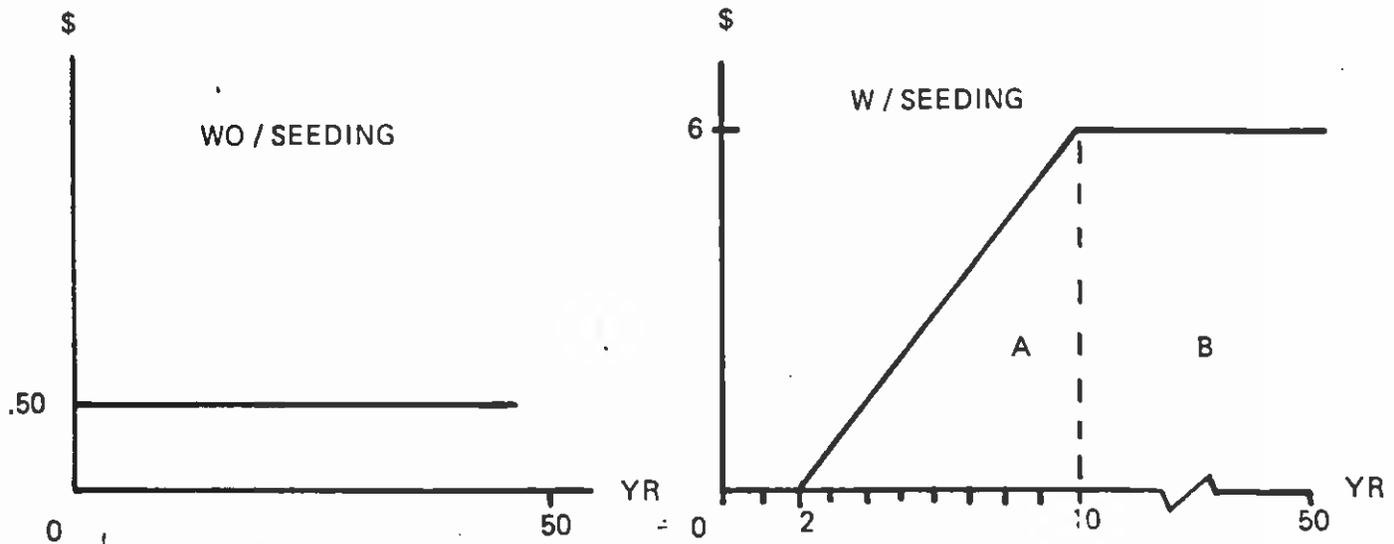
PROBLEM 9

THERE IS AN OPPORTUNITY FOR A FARMER TO CONSTRUCT AN IRRIGATION STORAGE STRUCTURE. A BUDGET ANALYSIS SHOWS HE CAN INCREASE HIS ANNUAL NET INCOME ON A 20-ACRE FIELD BY \$400 WITH ADDITIONAL WATER. HE IS INTERESTED BUT WANTS TO RECOVER HIS COSTS IN 10 YEARS. HOW MUCH CAN HE AFFORD TO SPEND FOR THIS IMPROVEMENT @ 10% INTEREST?



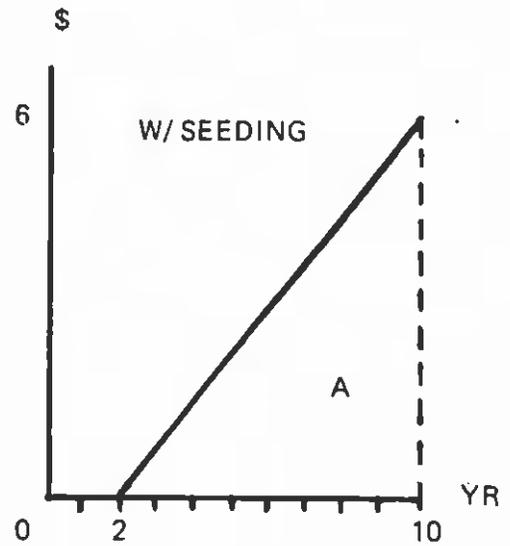
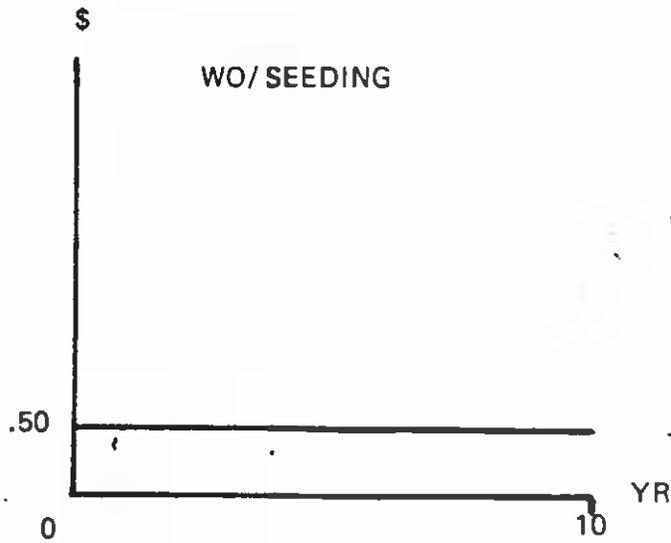
PROBLEM 10

A FARMER HAS A DETERIORATED PASTURE YIELDING A NET RETURN OF \$0.50 PER ACR IT WILL COST \$10 PER ACRE TO RESEED THE PASTURE. THE NEWLY SEEDED ACRE WILL BE OUT OF PRODUCTION TWO YEARS TO PERMIT THE GRASS TO BECOME ESTABLISHED. IT WILL TAKE AN ADDITIONAL EIGHT YEARS FOR THE PASTURE TO REACH ITS FULL PRODUCTIVITY. AT THIS TIME A NET RETURN OF \$6 PER ACRE CAN BE EXPECTED. ONCE ESTABLISHED, THE PASTURE UNDER GOOD MANAGEMENT WILL HAVE A PERMANENT LIFE. CAN THIS COST BE JUSTIFIED? A 10% INTEREST RATE IS USED. USE AN EVALUATION PERIOD OF 50 YEARS.



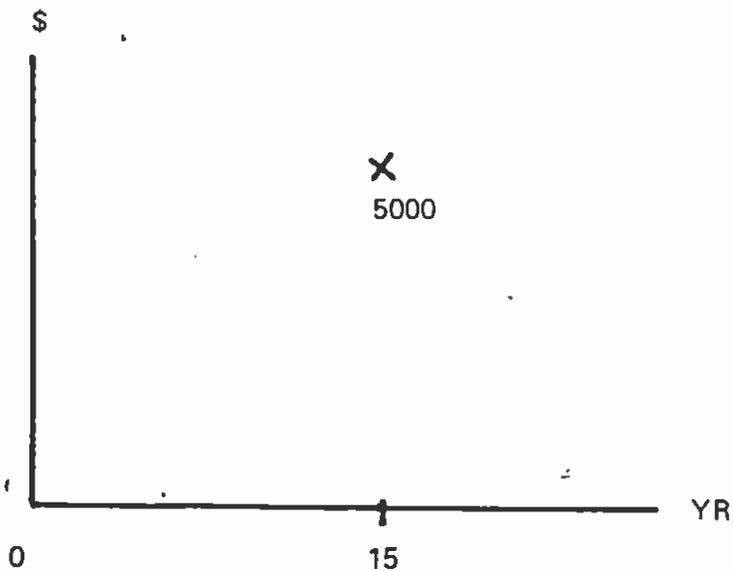
PROBLEM 11

THE SAME AS PROBLEM # 10 EXCEPT THE RANCHER WANTS TO KNOW IF HIS COSTS WILL BE RECOVERED IN 10 YEARS.



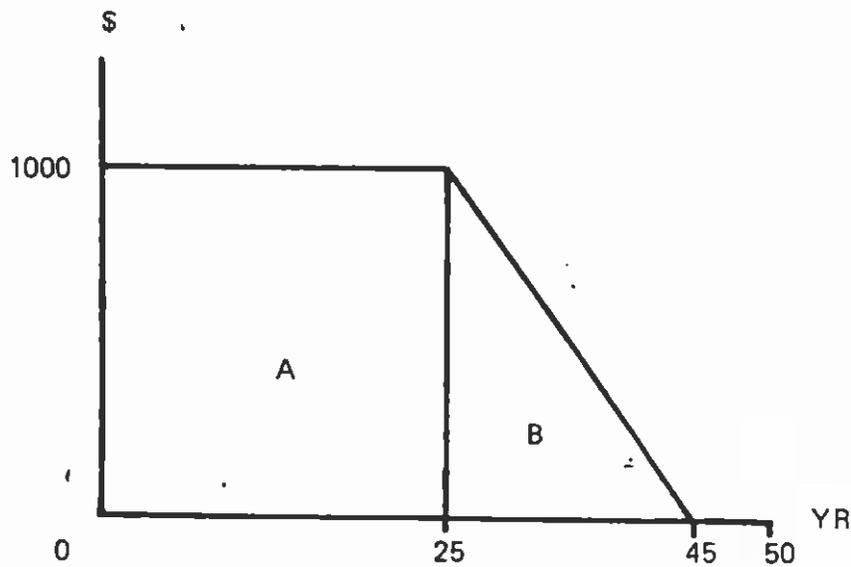
PROBLEM 12

A GULLY IS ADVANCING AT A RATE IN WHICH, IF NOT STABILIZED, WILL IN 15 YEARS REQUIRE WIDENING A BRIDGE SPAN AT AN ESTIMATED COST OF \$5,000. WITH THIS STRUCTURE INSTALLED, THE PRESENT BRIDGE WILL LAST FOR THE EVALUATION PERIOD. AT 10% INTEREST HOW MUCH CAN YOU AFFORD TO SPEND TO STABILIZE THE GULLY?



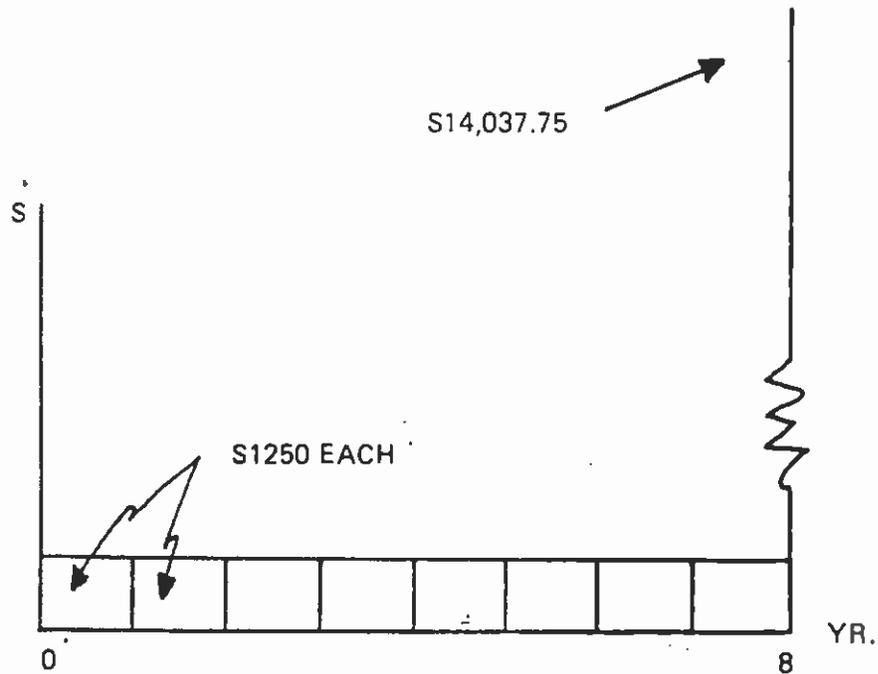
PROBLEM 13

A SEDIMENT POOL WILL PROVIDE BENEFITS OF \$1,000 PER YEAR FOR 25 YEARS. AFTER THIS, BECAUSE OF SILTATION, THE VALUE WILL DECLINE AT A UNIFORM RATE TO 0 IN THE 45TH YEAR. WHAT ARE THE ANNUAL BENEFITS FROM THE SEDIMENT POOL FOR RECREATION PURPOSES? A 50-YEAR EVALUATION PERIOD @ 10% INTEREST IS USED.



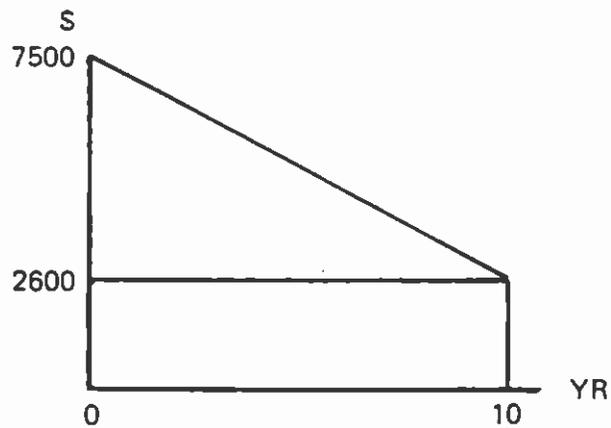
PROBLEM 14

HOW MUCH MONEY WILL ACCUMULATE IF AN INDIVIDUAL ENTERS INTO A SAVINGS PROGRAM BY INVESTING \$1250 PER YEAR AT 9.5% PER YEAR OVER 8 YEARS.



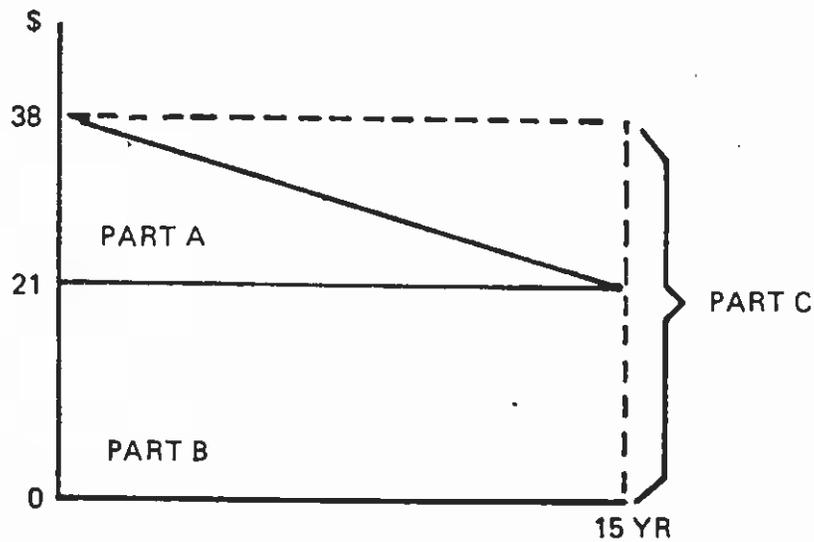
PROGRAM 15

IN 10 YEARS THE VALUE OF FISHING ACTIVITIES ALONG ONE SECTION OF A PERENNIAL STREAM WILL DROP FROM \$7500 PER YEAR TO \$2600. FIND THE PRESENT VALUE OF FISHING ACTIVITIES OVER THE 10 YEAR PERIOD AT 9.5% INTEREST.



PROBLEM 16

FIFTY ACRES OF CLASS IV CROPLAND ARE ERODING AT A RATE OF 32 TONS PER ACRE PER YEAR. OVER A 15 YEAR PERIOD, THE NET RETURNS PER ACRE WILL DECLINE FROM \$38.00 TO \$21.00. THE INSTALLMENT OF A RESOURCE MANAGEMENT SYSTEM WOULD MAINTAIN THE NET INCOME AT \$38.00 PER ACRE. FIND THE AVERAGE ANNUAL NET INCOMES, WITH AND WITHOUT THE RMS BASED ON A 8.5% INTEREST RATE.



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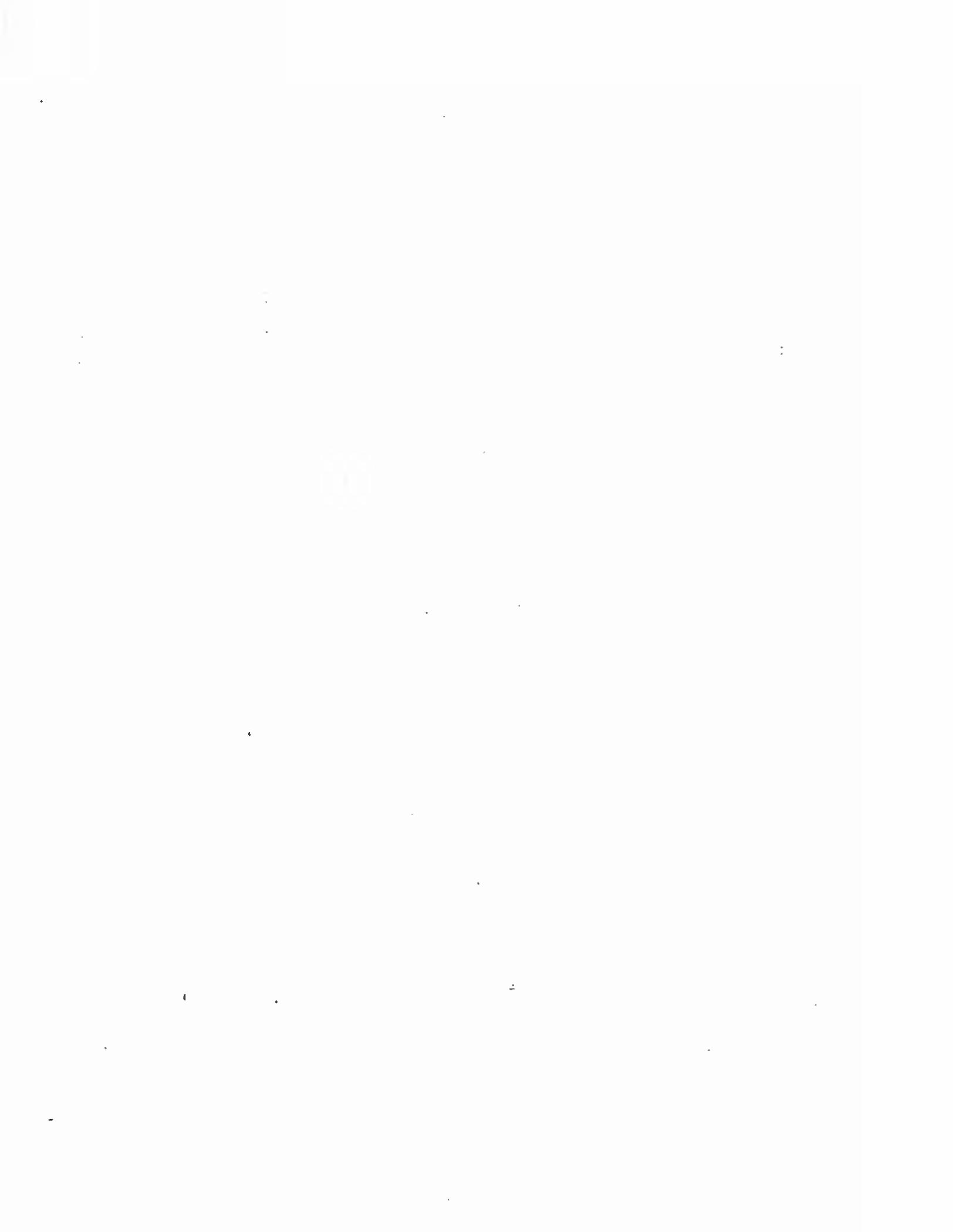
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Interest and Annuity

Answers to Exercises



PROBLEM 1

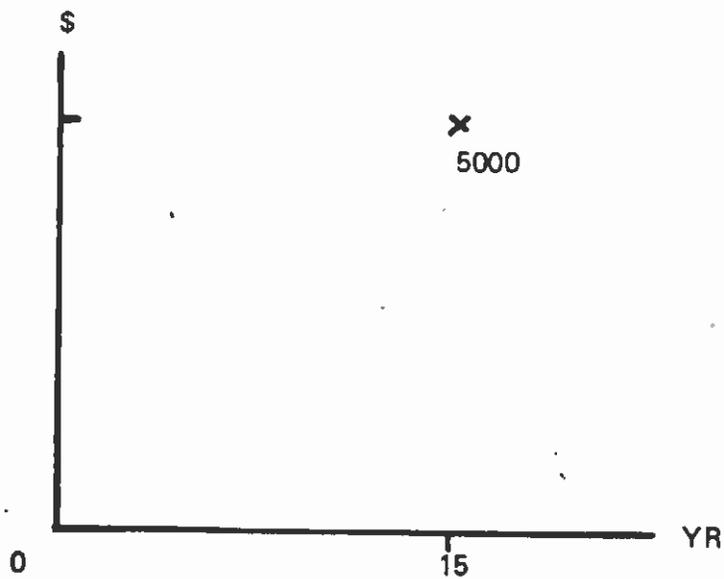
FIND THE PRESENT VALUE OF RECEIVING \$5000 15 YEARS HENCE AT 10% INTEREST.

PRINCIPLE

PV OF 1

(PV OF 1 - 15 - 10%) (5000)

$$(.23939) (5000) = \$1196.95$$



PROBLEM 2

FIND THE FUTURE VALUE OF PLACING \$2000 PER YEAR IN AN IRA AT 8% INTEREST FOR 15 YEARS.

PRINCIPLES

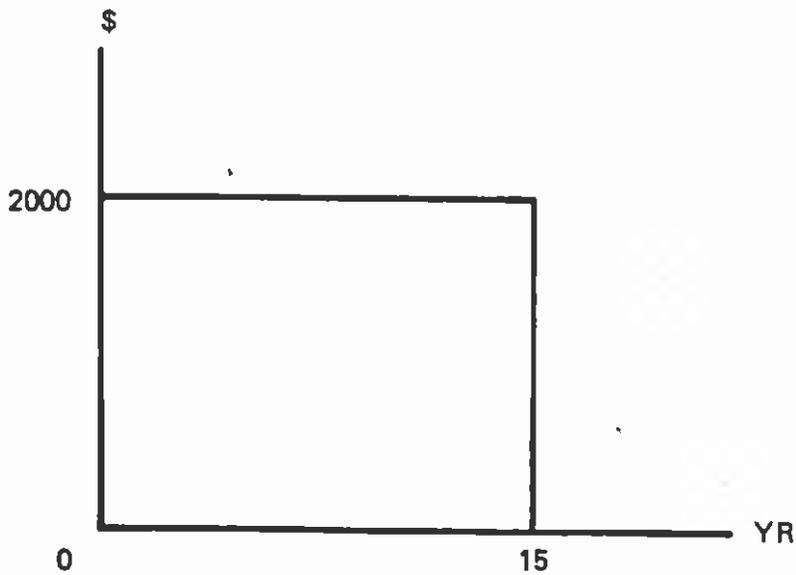
FV

AMT. OF ANN. OF 1

(AMT. OF ANN. OF 1 - 15 - 8%) (2000)

(27.15211) (2000)

= \$54,304.22



PROBLEM 3

YOUR SON IS 4 YEARS OLD. YOU ESTIMATE YOU WILL NEED \$30,000 FOR FOUR YEARS OF COLLEGE BEGINNING WHEN HE IS 18. HOW MUCH DO YOU HAVE TO PUT ASIDE EACH YEAR AT 8% INTEREST?

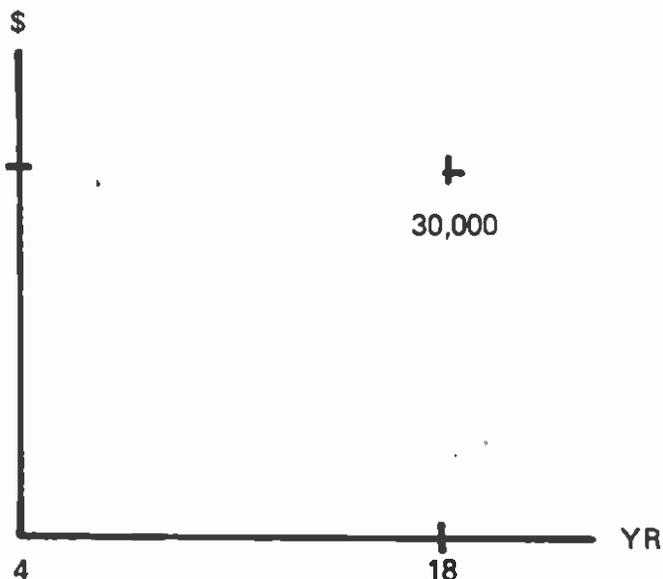
PRINCIPLES

ANNUITY

SINKING FUND

$$\begin{aligned} & (\text{SINK. FUND } \star - 14 - 8\%) (30,000) \\ & (.04130) (30,000) \qquad \qquad \qquad = \$1239/\text{YR.} \end{aligned}$$

$$\star \text{ SINK FUND FACTOR} = \frac{1}{\text{AMT. OF ANN. OF 1}} \quad \text{OR AMORT.} - i$$



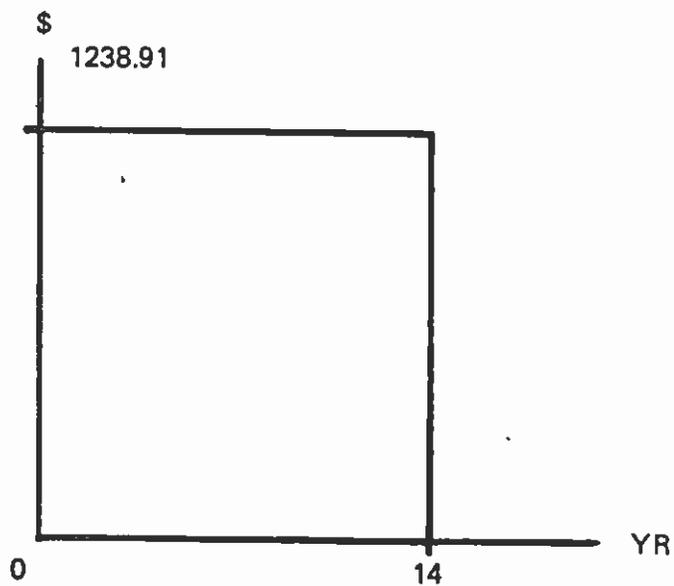
PROBLEM 4

FIND THE PRESENT VALUE OF PLACING \$1238.91 PER YEAR IN A SAVINGS ACCOUNT FOR 14 YEARS AT 8% INTEREST.

PRINCIPLES

PV

$$\begin{aligned} & (\text{PV OF ANN OF 1} - 14 - 8\%) (1238.91) \\ & (8.24424) (1238.91) \\ & = 10,213.87 \end{aligned}$$



PROBLEM 5

REFER TO PROBLEM 4. WHAT IS THE FUTURE VALUE OF THAT AMOUNT?

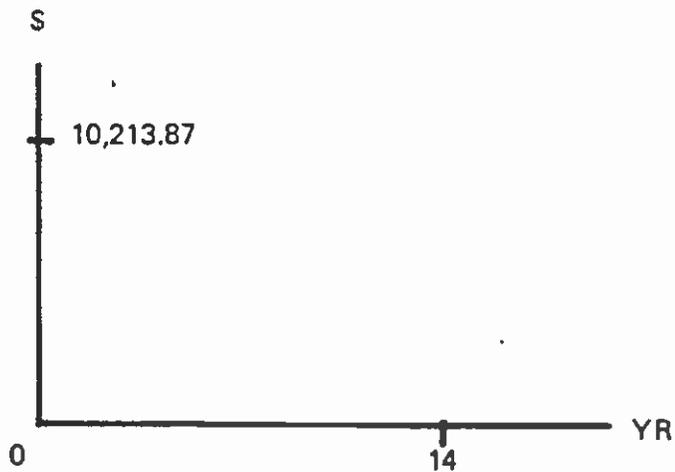
PRINCIPLE

FV

$$(1/PV \text{ OF } 1 - 14 - 8\%) (10213.87)$$

$$(1/.34046) (10213.87)$$

$$= 30,000.21$$



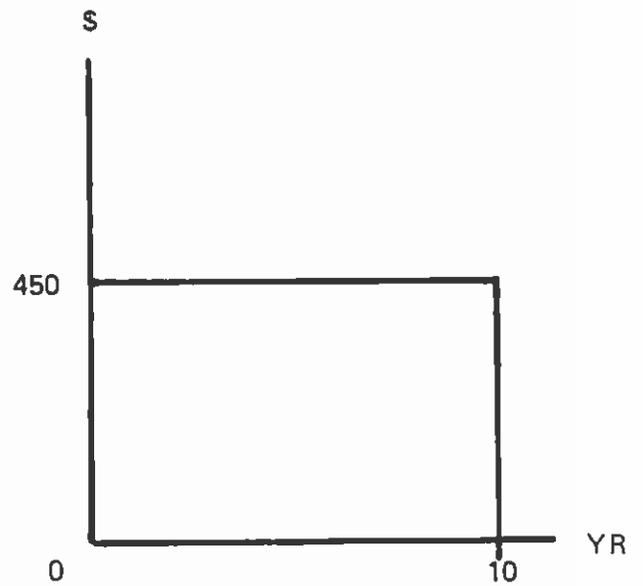
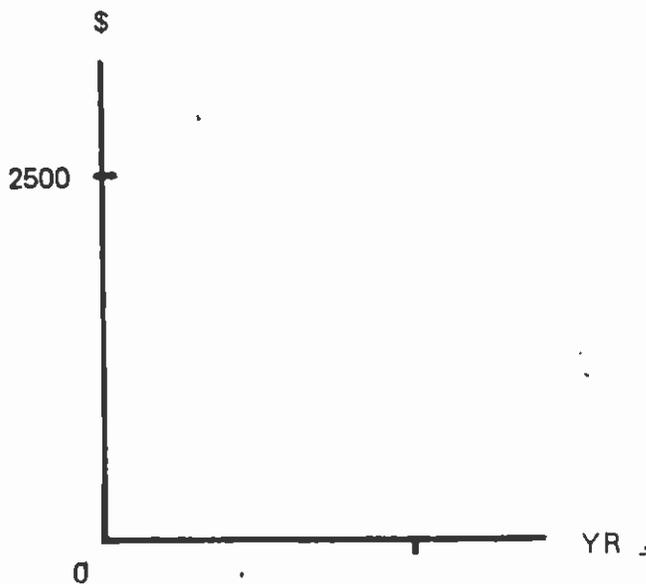
PROBLEM 6

A FARMER IS CONSIDERING A TERRACE SYSTEM COSTING \$2,500. THE TERRACE SYSTEM WILL PERMIT HIM TO USE HIS LAND MORE INTENSIVELY. COST-RETURN BUDGETS INDICATE HE CAN INCREASE HIS NET RETURNS, EXCLUDING THE COST OF THE TERRACES, BY \$450 ANNUALLY. HE CAN OBTAIN A LOAN FOR 10 YEARS @ 10% INTEREST. HE WANTS TO EVALUATE THE FEASIBILITY OF INSTALLING THE TERRACE SYSTEM.

PRINCIPLE

ANNUAL EQUIVALENT COST

$$\begin{aligned} & (\text{AMORT} - 10 - 10\%) (2500) \\ & (.16275) (2500) = 406.88 \\ \Delta \text{ RETURN} & = 450.00 \\ \Delta \text{ COST} & = 406.88 \\ \text{NET BENEFIT} & = 43.12 \end{aligned}$$



PROBLEM 7

SAME AS ABOVE EXCEPT IT IS ESTIMATED IN ADDITION TO THE COST OF INSTALLING THE TERRACE SYSTEM, IT WILL REQUIRE \$50 ANNUALLY TO MAINTAIN THEM. WHAT IS THE TOTAL ANNUAL COST AND BENEFIT.

PRINCIPLE

ANNUAL COST

$$\begin{aligned} \text{ANN. COST} &= \text{ANN. EQUIV.} + \text{O \& M} \\ &= 406.88 + 50. \\ &= 456.88 \end{aligned}$$

$$\Delta \text{ RETURN} = 450.00$$

$$\Delta \text{ COST} = 456.88$$

$$\text{NET BENEFIT} = -6.88$$

PROBLEM 8

A FARMER IS CONSIDERING PLANTING AN ACRE OF TREES FOR SALE AS CHRISTMAS TREES. IT WILL TAKE 10 YEARS BEFORE THE TREES WILL BE OF MARKETABLE VALUE. AT THAT TIME A NET RETURN OF \$500 PER ACRE CAN BE EXPECTED. THE PRESENT NET RETURN ON THIS LAND IS \$30 PER ACRE. HOW CAN THESE TWO ALTERNATIVES BE EVALUATED SO THE FARMER CAN MAKE HIS DECISION? IT IS ASSUMED 10% INTEREST WILL BE APPLICABLE.

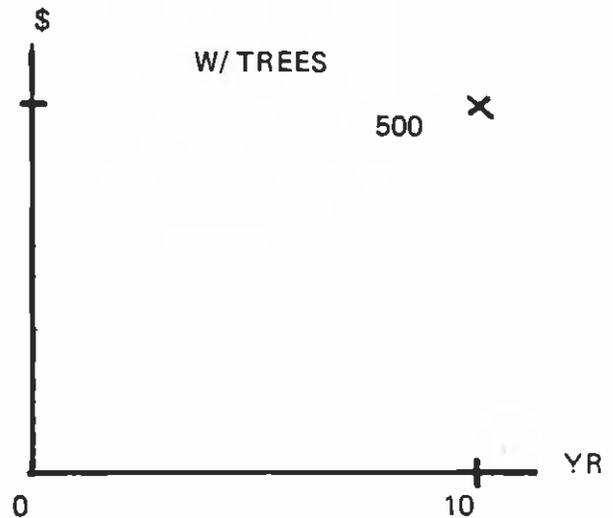
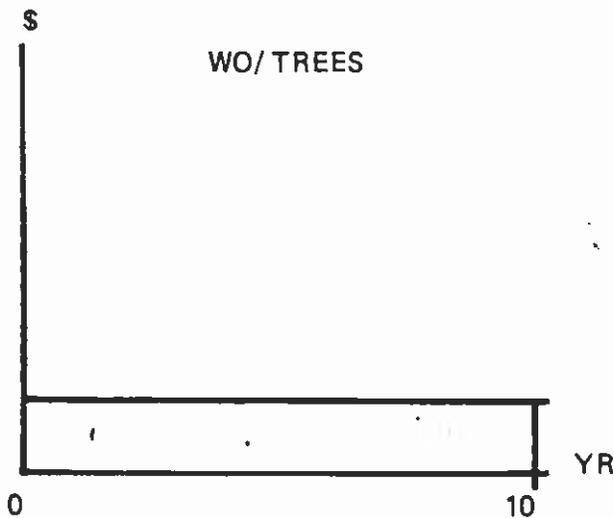
RETURN WO/TREES

$$\begin{aligned} & (\text{PV OF ANN. OF 1} - 10 - 10\%) (30) \\ & (6.14457) (30) = 184.34 \end{aligned}$$

RETURN W/TREES

$$\begin{aligned} & (\text{PV OF 1} - 10 - 10\%) (500) \\ & (.38554) (500) = 192.77 \end{aligned}$$

$$\begin{aligned} \Delta \text{ RETURN} &= (\text{RET. W/TREES} - \text{RET. WO/TREES}) \\ &= 192.77 - 184.34 \\ &= 8.43 \end{aligned}$$



PROBLEM 9

THERE IS AN OPPORTUNITY FOR A FARMER TO CONSTRUCT AN IRRIGATION STORAGE STRUCTURE. A BUDGET ANALYSIS SHOWS HE CAN INCREASE HIS ANNUAL NET INCOME ON A 20-ACRE FIELD BY \$400 WITH ADDITIONAL WATER. HE IS INTERESTED BUT WANTS TO RECOVER HIS COSTS IN 10 YEARS. HOW MUCH CAN HE AFFORD TO SPEND FOR THIS IMPROVEMENT @ 10% INTEREST?

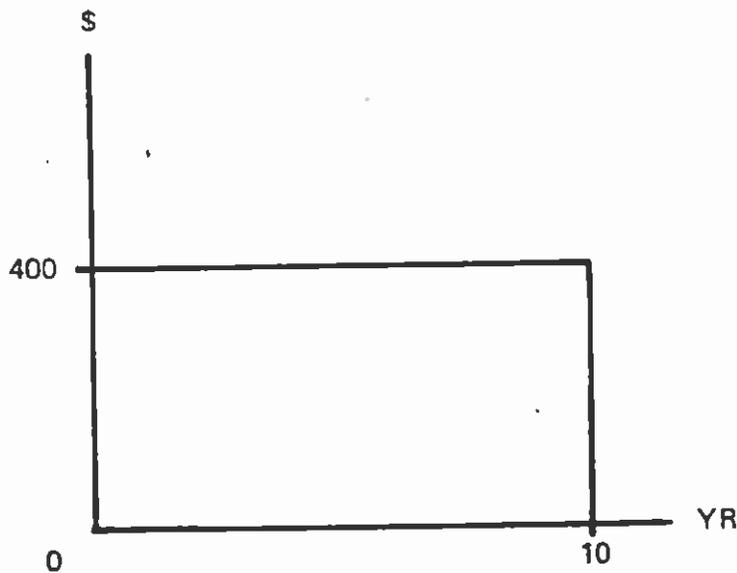
PRINCIPLE

PV OF ANNUITY OF 1

(PV OF ANN. OF 1 - 10 - 10%) (400)

(6.14457) (400)

= 2457.83



PROBLEM 10

A FARMER HAS A DETERIORATED PASTURE YIELDING A NET RETURN OF \$0.50 PER AC. IT WILL COST \$10 PER ACRE TO RESEED THE PASTURE. THE NEWLY SEEDING ACRE WILL BE OUT OF PRODUCTION TWO YEARS TO PERMIT THE GRASS TO BECOME ESTABLISHED. IT WILL TAKE AN ADDITIONAL EIGHT YEARS FOR THE PASTURE TO REACH ITS FULL PRODUCTIVITY. AT THIS TIME A NET RETURN OF \$6 PER ACRE CAN BE EXPECTED. ONCE ESTABLISHED, THE PASTURE UNDER GOOD MANAGEMENT WILL HAVE A PERMANENT LIFE. CAN THIS COST BE JUSTIFIED? A 10% INTEREST RATE IS USED. USE AN EVALUATION PERIOD OF 50 YEARS.

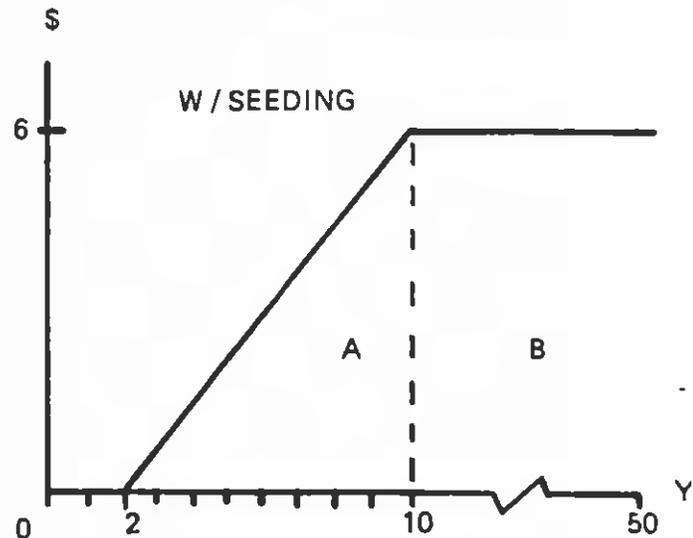
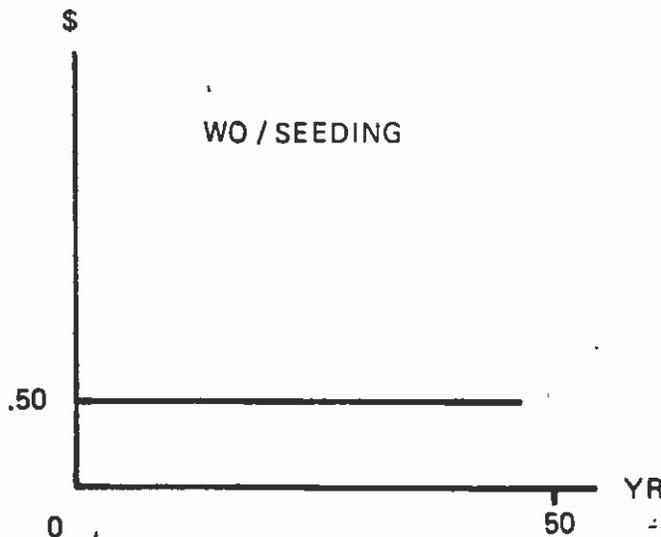
$$\begin{aligned} & \text{(PV OF ANN. OF 1 - 50 - 10\%)} (.50) \\ & \quad (9.91481) (.50) \\ & = 4.96 \end{aligned}$$

$$\begin{aligned} \Delta \text{RET} &= 35.86 - 4.96 \\ &= 30.90 \end{aligned}$$

$$\begin{aligned} \text{NET BENEFIT} &= \Delta \text{RET} - \text{COST} \\ &= 30.90 - 10 \\ &= 20.90 \end{aligned}$$

$$\begin{aligned} & \text{a.} \\ & \text{(PV OF INC. ANN. - 8 - 10\%)} (6/8) \\ & \quad (21.3636) (.75) = 16.02 \\ & \text{(PV OF 1 - 2 - 10\%)} (16.02) \\ & \quad (.82645) (16.02) = \underline{13.24} \end{aligned}$$

$$\begin{aligned} & \text{b.} \\ & \text{(PV OF ANN. OF 1 - 40 - 10\%)} (6) \\ & \quad (9.77905) (6) = 58.67 \\ & \text{(PV OF 1 - 10 - 10\%)} (58.67) \\ & \quad (.38554) (58.67) = \underline{22.62} \\ & \text{A + B} = \underline{35.86} \end{aligned}$$



PROBLEM 11

THE SAME AS PROBLEM # 10 EXCEPT THE RANCHER WANTS TO KNOW IF HIS COSTS WILL BE RECOVERED IN 10 YEARS.

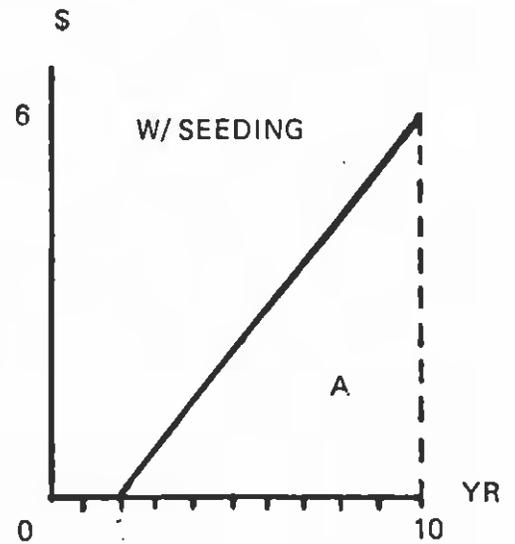
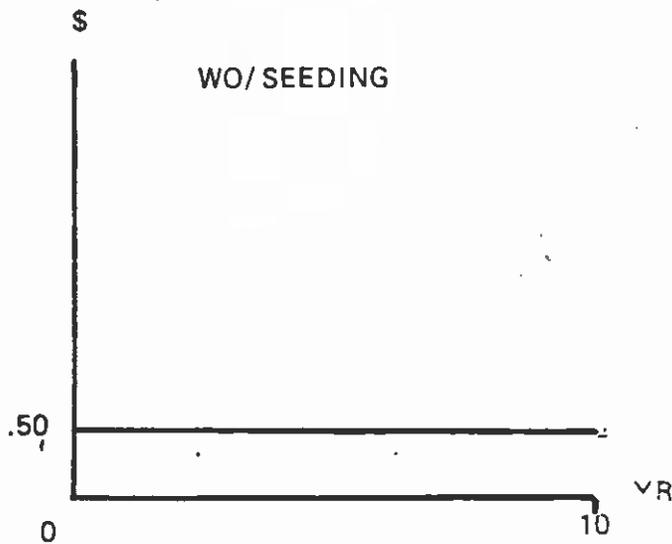
$$\begin{aligned} & (\text{PV OF ANN. OF 1 - 10 - 10\%}) (.50) \\ & (6.14456) (.50) \\ & = 3.07 \end{aligned}$$

$$\begin{aligned} \Delta \text{ RET} & = 13.24 - 3.07 \\ & = 10.17 \end{aligned}$$

$$\begin{aligned} \text{NET BENEFIT} & = 10.17 - 10 \\ & = .17 \end{aligned}$$

a.

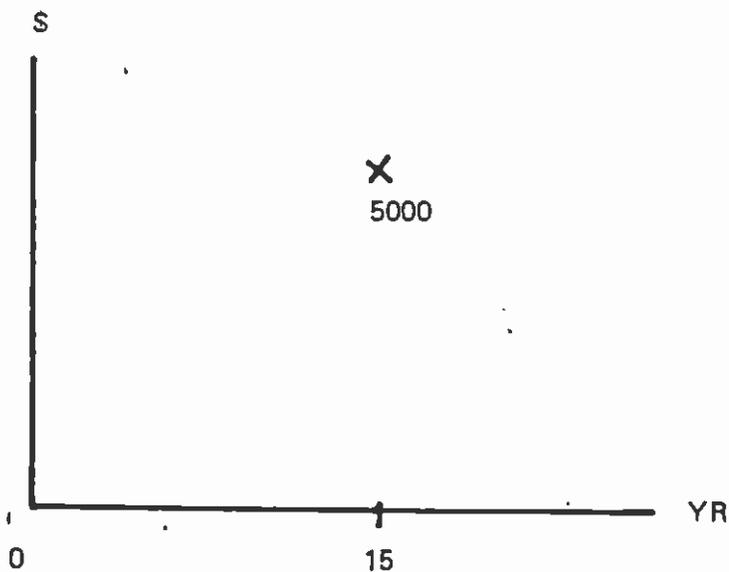
SAME AS a. IN
PROBLEM 10
13.24



PROBLEM 12

A GULLY IS ADVANCING AT A RATE IN WHICH, IF NOT STABILIZED, WILL IN 15 YEARS REQUIRE WIDENING A BRIDGE SPAN AT AN ESTIMATED COST OF \$5,000. WITH THIS STRUCTURE INSTALLED, THE PRESENT BRIDGE WILL LAST FOR THE EVALUATION PERIOD. AT 10% INTEREST HOW MUCH CAN YOU AFFORD TO SPEND TO STABILIZE THE GULLY?

$$\begin{aligned} & (\text{PV OF } 1 - 15 - 10\%) (5000) \\ & \quad (.23939) (5000) \\ & = 1196.95 \end{aligned}$$



PROBLEM 13

A SEDIMENT POOL WILL PROVIDE BENEFITS OF \$1,000 PER YEAR FOR 25 YEARS. AFTER THIS, BECAUSE OF SILTATION, THE VALUE WILL DECLINE AT A UNIFORM RATE TO 0 IN THE 45TH YEAR. WHAT ARE THE ANNUAL BENEFITS FROM THE SEDIMENT POOL FOR RECREATION PURPOSES? A 50-YEAR EVALUATION PERIOD @ 10% INTEREST IS USED.

A.

(PV OF ANN. OF 1 - 25 - 10%) (1000)

(9.07704) (1000)

= 9077.04

B.

(PV OF DEC. ANN. - 20 - 10%) (1000/20) (PV OF 1 - 25 - 10%)

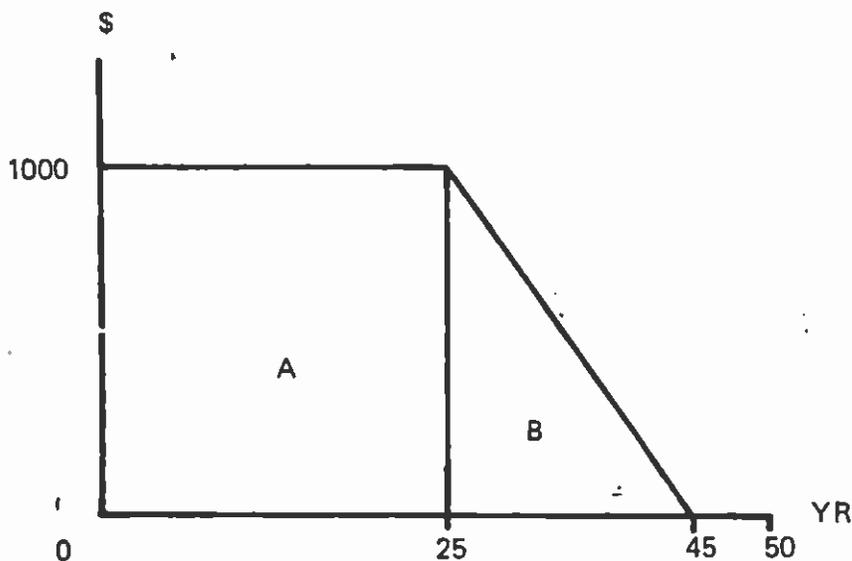
(114.86436) (50) (.09230)

= 530.10

(AMORT. - 50 - 10%) (9077.04 + 530.10)

(.10086) (9607.14)

= \$968.98/YR

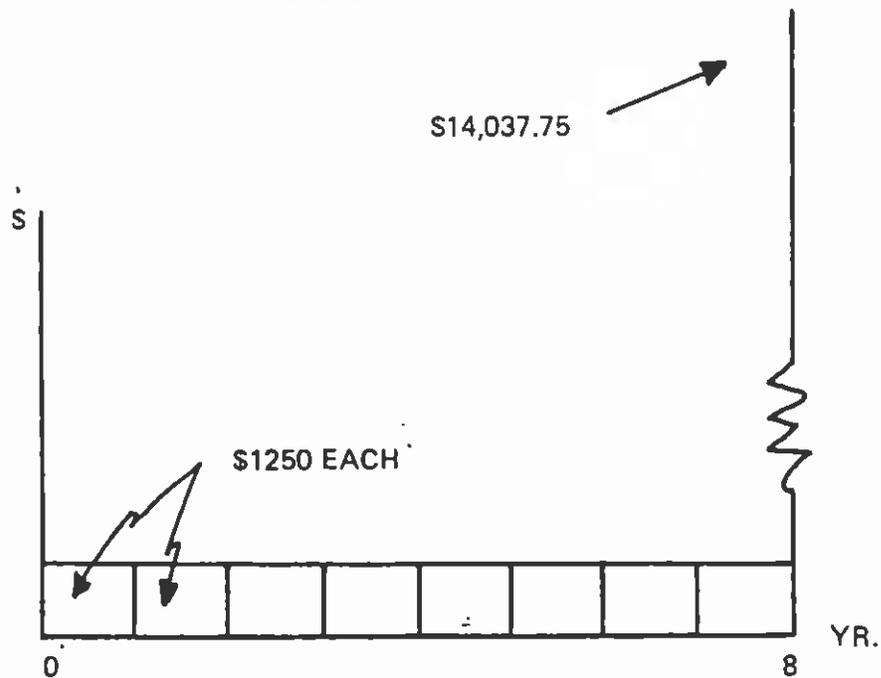


PROBLEM 14

HOW MUCH MONEY WILL ACCUMULATE IF AN INDIVIDUAL ENTERS INTO A SAVINGS PROGRAM BY INVESTING \$1250 PER YEAR AT 9.5% PER YEAR OVER 8 YEARS.

PRINCIPLE

$$\begin{array}{rcl} \text{AMOUNT OF AN ANNUITY OF 1 PER YEAR} & & \\ \text{(AMOUNT OF ANN. OF 1 - 8 - 9.5)} & (1250) & \\ (11.23020) & (1250) & = \$14,037.75 \end{array}$$



PROGRAM 15

IN 10 YEARS THE VALUE OF FISHING ACTIVITIES ALONG ONE SECTION OF A PERENNIAL STREAM WILL DROP FROM \$7500 PER YEAR TO \$2600. FIND THE PRESENT VALUE OF FISHING ACTIVITIES OVER THE 10 YEAR PERIOD AT 9.5% INTEREST.

PRINCIPLES

PV OF A DECREASING ANNUITY

PV OF AN ANNUITY

$$\$7500 - 2600 = \$4900 \div 10 \text{ YEARS} = \$490$$

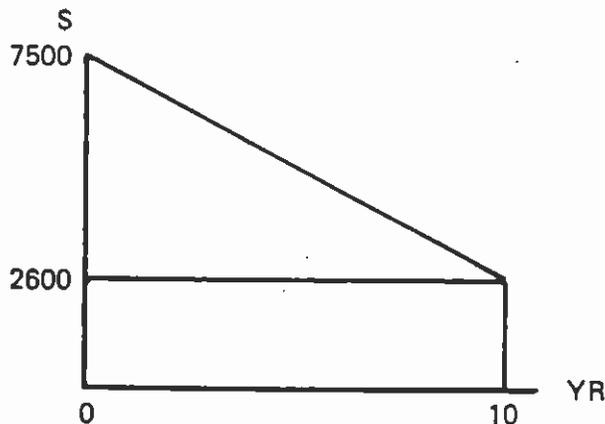
(PV OF A DECREASING ANNUITY, 1/YR. - 10 - 9.5%) (490)

$$(39.17055) \quad (490) \quad = \quad \$19,193.57$$

(PV OF AN ANNUITY OF 1 - 10 - 9.5%) (2600)

$$(6,27880) \quad (2600) \quad = \quad \$16,324.88$$

$$\$19,193.57 \quad + \quad 16,324.88 \quad = \quad \$35,518.45$$



PROBLEM 16

FIFTY ACRES OF CLASS IV CROPLAND ARE ERODING AT A RATE OF 32 TONS PER ACRE PER YEAR. OVER A 15 YEAR PERIOD, THE NET RETURNS PER ACRE WILL DECLINE FROM \$38.00 TO \$21.00. THE INSTALLMENT OF A RESOURCE MANAGEMENT SYSTEM WOULD MAINTAIN THE NET INCOME AT \$38.00 PER ACRE. FIND THE AVERAGE ANNUAL NET INCOMES, WITH AND WITHOUT THE RMS BASED ON A 8.5% INTEREST RATE.

PRINCIPLES

PV OF A DECREASING ANNUITY
AMORTIZATION

PART A $\$38.00 - 21.00 = 17.00 \div 15 \text{ YR.} = \1.13 PER YEAR

(PV OF A DECREASING ANNUITY - 15 - 8.5%) (AMORT. - 15 - 8.5%) (1.13)
(78.77369) (.12042) (1.13) = \$10.71

PART A AND PART B ($\$10.71 + 21.00$) (50 AC.) = \$1585 (WITHOUT)

PART C ($\$38$) (50 AC.) = \$1900 (WITH)

