MATH 210 FINITE MATHEMATICS

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5.3 Amortization and Sinking Funds

Definition 1: Amortization Formula

The periodic payment R on a loan of P dollars to be amortized over n periods with interest charged at the rate of i per period is

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

Example 1

A car dealership offers 2.5% financing over a 5 year loan period for a car priced at \$10,000. The other option is a \$700 rebate but you must finance at 4% over 5 years. Which option is better?

$P=10{,}000,\ r=.025,\ t=5,\ n=12$

2.5%: $R = \frac{10{,}000\left(\frac{.025}{12}\right)}{1-(1+.025/12)^{-60}} = \frac{20.8333333}{.117388341} = \$177.47$

700 REBATE: $R = \frac{9300(.04/12)}{1-(1+.04/12)^{-60}} = \frac{31}{.180996896}$

$= 171.27$

Example 2

Mike purchased a house for \$200,000, put down 10%, and financed the remaining balance with a 5% interest over 30 years. What should the monthly mortgage payment be? How much did Mike pay in interest?

10% OF 200,000 IS \$20,000. LOAN AMOUNT IS \$180,000

KNOW: $t=30$, $r=.05$, $m=12$, $P=180{,}000$

$$R=\frac{180000(.05/12)}{1-(1+.05/12)^{-360}}=\frac{750}{.776173404}$$

$$=\$966.28$$

OVERALL MIKE PAYS $966.28 \times 360 = \$347{,}860.80$ FOR A 180,000 LOAN

INTEREST = $347{,}860.80 - 180{,}000$

$$= 167{,}860.80$$

Example 3

Brian needs to save \$150,000 to pay off a debt in 10 years. He will pay monthly payments into an account earning 4% compounded quarterly. What size payment should he make?

SINKING FUND ↓

"SAME AS FUTURE VALUE OF ANNUITY $S = R\left[\frac{(1+i)^n - 1}{i}\right]$

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

$$R = \frac{150000\left(\frac{.04}{4}\right)}{(1+.04/4)^{10\cdot 4} - 1} = \frac{1500}{.0348886373}$$

$$= \$3068.34$$