

Name: \_\_\_\_\_

**MATH 110 – EXAM 6**  
**26 April 2004**

**Directions:** There are nine questions on this exam. Answer every question. Show all work and justify your answers. Each question is worth five points.

1. Phoenix puts \$500 in an investment fund earning 7.3%. How much is in the account after 20 years?
2. Pierre has borrowed \$3000 from his father at 5% interest. He doesn't pay back any of the money for a full year. How much does he owe his dad at the end of the year?
3. Montgomery decides to put \$50 a month into a stock fund which earns 9%. How much is in his account after 10 years?

4. Lincoln owes \$4000 on his credit card, which charges 21% interest. He has decided to stop charging anything else on his credit card and to pay off the balance in 3 years. How much would he need to pay each month to accomplish this?
  
  
  
  
  
  
  
  
  
  
5. Dover borrowed \$35,000 from the bank at an APR of 7% and will be paying this loan off for the next 15 years, making monthly payments of \$314.69.
  - (a) How many payments will Dover make?
  
  
  
  
  
  
  
  - (b) What is the total value of all the payments?
  
  
  
  
  
  
  
  - (c) How much goes to interest?
  
  
  
  
  
  
  
  
  
  
6. You are giving financial advice to Dover from the previous problem. He tells you, "The bank says that I can lower my monthly payments to only \$276.63 a month by spreading the loan out over 20 years, but they'd have to raise the interest rate to 7.25%." Should he go with the original loan (from the previous problem)? This new loan? Try something else? You do not need to do any computations, just back up your opinion with general principles from financial math.



[Bonus (non-mathematical): 3 points] What is the theme for naming the word-problem-people in this course? [Hint: On previous exams Austin and Jackson drew triangles, Olympia and Augusta drew planar graphs, and Helena had opinions.] How does the name of Madison's cat fit into this?

The following abbreviations will be used in formulas.

$P$	Principal – the original amount invested or borrowed
$A$	Account balance.
$r$	interest rate (written as a decimal)
$Y$	number of years
$PMT$	regular payment amount
$n$	number of payments per year ( $n$ is 12 for monthly payments)

If you invest  $\$P$  at an interest rate of  $r\%$  and leave the money in the account for  $Y$  years (untouched — making no deposits to or withdrawals from the account), the balance is given by the formula:  $A = P(1 + r)^Y$ . Similarly, if you borrow  $\$P$  at an interest rate of  $r\%$  and make no payments for  $Y$  years, the balance that you owe is given by the same formula:  $A = P(1 + r)^Y$ .

If you have a principal of  $\$P$  invested at an interest rate of  $r\%$ , the interest that accumulates in one year is  $P \times r$ .

If you have a savings account which is earning  $r\%$  interest and you deposit  $\$PMT$  to the account  $n$  times a year and continue doing this for  $Y$  years, the amount of money in the account is given by the formula:

$$A = PMT \times \frac{\left[ \left(1 + \frac{r}{n}\right)^{(nY)} - 1 \right]}{\left(\frac{r}{n}\right)}$$

If you borrow  $\$P$  at an interest rate of  $r\%$  and pay it back by making  $n$  equal payments a year for  $Y$  years, the size of the payment is given by the formula:

$$PMT = \frac{P \times \left(\frac{r}{n}\right)}{\left[1 - \left(1 + \frac{r}{n}\right)^{(-nY)}\right]}$$