

Here are some things to look at as you prepare for the exam. Remember to look at quizzes and homework problems also. The actual exam will consist of a large number of true/false and multiple choice problems, but the problems below will help you understand the concepts covered on the exam. Try to do as many of these as you can without looking in your notes or book for guidance.

The second exam will be on Thursday, 4 November, 2004 and will cover material in Ch. 2 and 3.

1. If world population continues to grow as expected, the population (in billions) in year t will be given by the function

$$P(t) = 4.834(1.01)^{(t-1980)}$$

- (a) Estimate the world population in the year 2005
 - (b) Estimate the world population in the year 2010
 - (c) Estimate the world population in the year 2030
2. The scrap value of a machine is the value of the machine at the end of its useful life. By one method of calculating scrap value, where it is assumed a constant percentage of value is lost annually, the scrap value S is given by

$$S = C(1 - r)^n$$

where C is the original cost, n is the useful life of the machine in years, and r is the constant annual percentage of value lost. Find the scrap value for each of the following machines:

- (a) Original Cost \$54,000; life 8 years; annual rate of loss 12%
 - (b) Original Cost \$178,000; life 11 years; annual rate of loss 14%
3. The US Census Bureau predicts that the African-American population will increase from 35.3 million in 2000 to 59.2 million in 2050.
 - (a) Find an exponential model for this data in which $t = 0$ corresponds to 2000.
 - (b) What is the projected African-American population in 2004? in 2030?
 - (c) Estimate the year in which the African American population will reach 55 million.
 4. Newton's Law of Cooling says that the rate at which a body cools is proportional to the difference in temperature between the body and an environment into which it is introduced. The temperature $F(t)$ of the body at time t after being introduced into an environment have constant temperature T_0 is

$$F(t) = T_0 + Cb^t$$

where C and b are constants.

Boiling water, at 100°C , is placed in a freezer at 0°C . The temperature of the water is 50°C after 24 minutes. Find the temperature of the water after 96 minutes.

5. Simplify the following expressions:

- (a) $\ln e^3$
- (b) $10^{\log 7.4}$
- (c) $\log_8 16$
- (d) $\log_{25} 5$

6. Write each expression as a single logarithm:

- (a) $\log 4k + \log 5k^3$
- (b) $4 \ln x - 2(\ln x^3 + 4 \ln x)$

7. Solve each equation:

- (a) $\ln(m + 3) - \ln m = \ln 2$
- (b) $2 \ln(y + 1) = \ln(y^2 - 1) + \ln 5$
- (c) $\log(m + 2) = 1$
- (d) $\log_2(3k - 2) = 4$
- (e) $\log_5 \left(\frac{5z}{z - 2} \right) = 2$
- (f) $\log_2 r + \log_2(r - 2) = 3$
- (g) $2^{3x} = \frac{1}{8}$
- (h) $\left(\frac{9}{16} \right)^x = \frac{3}{4}$
- (i) $9^{2y-1} = 27^y$
- (j) $8^p = 19$
- (k) $6^{2-m} = 2^{3m+1}$
- (l) $2 \cdot 15^{-k} = 18$

8. Find the simple interest for an investment of \$4902 at 9/5% for 11 months.

9. Find the future value of an investment of \$3478 at 7.4% for 88 days (assume 365 days in a year).

10. Find the present value of the future amount \$459.57 if the money is invested at a simple interest rate of 8.5% for 7 months.

11. Find the amount of money in an account in which the initial deposit is \$2800 earning 6% interest compounded annually after 10 years.

12. Find the present value of the future amount \$42,000 if the money is deposited in an account paying 12% compounded monthly for 7 years.

13. Know the following formulas. They will **NOT** be provided on the exam.

	Interest	Future Value	Present Value
Simple Interest	$I = Prt$	$A = P(1 + rt)$	$P = \frac{A}{1 + rt}$
Compound Interest	$I = A - P$	$A = P(1 + i)^n$	$P = \frac{A}{(1 + i)^n}$
Continuous Interest	$I = A - P$	$A = Pe^{rt}$	$P = \frac{A}{e^{rt}}$
Ordinary Annuity		$S = R \left(\frac{1 + i)^n - 1}{i} \right)$	$P = R \left(\frac{1 - (1 + i)^{-n}}{i} \right)$

14. Find the future value of the annuity where \$1288 is deposited at the end of each year for 14 years, where the money earns 8% compounded annually.
15. Find the future value of the annuity where \$233 is deposited at the end of each month for 4 years and the money earns 12% compounded monthly.
16. Find the present value of the ordinary annuity where payments of \$850 are made annually for 4 years at 5% compounded annually.
17. Find the present value of the ordinary annuity where payments of \$4210 are made semiannually for 8 years at 8.6% compounded semiannually.
18. Find the amount of the payment necessary to amortize a loan of \$32,000 at 9.4% compounded quarterly to be repaid in 10 quarterly payments.
19. Find the monthly house payment for a mortgage of \$56,890 at 10.74% for 25 years.
20. A firm of attorneys deposits \$15,000 of profit-sharing money in an account at 6% compounded semiannually for 7.5 years. Find the amount of interest earned.
21. According to a financial web site, Bank A paid 6.9% interest compounded quarterly on a one year CD, and Bank B paid 6.88% compounded monthly. What are the effective rates for the two CDs and which bank pays a higher effective rate?
22. Each year a firm must set aside enough funds to provide employee retirement benefits of \$52,000 in 20 years. If the firm can invest money at 7.5% compounded monthly, what amount must be invested at the end of each month for this purpose?
23. In 3 years, Mary must pay a pledge of \$7500 to her favorite charity. What lump sum can she deposit today, at 10% compounded semiannually, so that she will have enough to pay the pledge?