

MATH 1330 Final Exam– Fall 2017

You must show your work in the blue book to receive credit. Allow at least one full page for each problem.

Math of Finance Formulas

Simple Interest: $S = P(1 + rt)$

Compound Interest: $S = P(1 + i)^n$, $S = Pe^{rt}$

Effective Rate: $APY = (1 + \frac{r}{m})^m - 1$, $APY = e^r - 1$

Annuities: Future value $S = R[\frac{(1 + i)^n - 1}{i}]$, Present value $A = R[\frac{1 - (1 + i)^{-n}}{i}]$

t = number of years, r = annual percentage rate, m = number of periods per year,
 i = interest rate per period, n = total number of periods, R = periodic payment.

1.(20p) Suppose a computer manufacturer sells computers at \$375 per unit. The variable cost for producing a unit is \$75 and the fixed cost for the production is \$3900.

- (5p) What is the cost function $C(x)$ for producing x units?
- (5p) What is the revenue function $R(x)$ for producing x units?
- (5p) What is the profit function $P(x)$ for producing and selling x units?
- (5p) Find the break-even revenue.

2.(10p) Suppose a recent college graduate's first job allows her to deposit \$150 at the end of each month in a savings plan that earns 12% compounded monthly. This savings plan continues for 13 years before new obligations make it impossible to continue. If the accrued amount remains in the plan for the next 15 years without deposits or withdrawals, how much money will be in the account 28 years after the plan began?

3.(10p) Set up equations and solve.

One safe investment pays 10% per year, and a more risky investment pays 18% per year. A woman has \$149,600 to invest and would like to have an income of \$20,000 per year from her investments. How much should she invest at each rate?

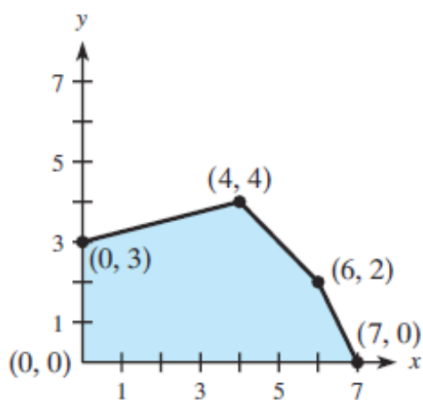
4.(10p) With a present value of \$120,000, what is the size of the withdrawals that can be made at the end of each quarter for the next 10 years if money is worth 7.1% compounded quarterly? (Round your answer to the nearest cent.)

5.(10p) The tables below give numbers of species of threatened and endangered wildlife in the US and in foreign countries in 2012.

United States					
	Mammals	Birds	Reptiles	Amphibians	Fishes
Endangered	70	78	14	15	82
Threatened	14	13	20	9	65
Foreign					
	Mammals	Birds	Reptiles	Amphibians	Fishes
Endangered	256	208	69	8	11
Threatened	16	15	17	1	1

- (a) (5p) Write a matrix A that contains the number of each of these species in the U.S. in 2012 and a matrix B that contains the number of each of these species outside the U.S. in 2012.
- (b) (5p) Find the matrix $B - A$. What do the negative entries in matrix $B - A$ mean?

6.(10p) Use the given feasible region determined by the constraint inequalities to find the maximum and minimum of the objective function $C = 9x + 5y$ (if they exist). (If an answer does not exist, enter DNE.)



- (a) (5p) Maximum C
- (b) (5p) Minimum C

7.(10p) The demand function for a product is given by $p = 3000e^{-q/3}$, where q is quantity demanded and p is price per unit.

- (a) (5p) At what price per unit will the quantity demanded equal 6 units?
- (b) (5p) If the price is \$149.40 per unit, how many units will be demanded, to the nearest unit?

8.(10p) Which investment will earn more money, a \$2,000 investment for 10 years at 7% compounded annually or a \$1,500 investment for 10 years compounded continuously at 10%?

9.(10p) A couple invested \$25,000 dollars in a bank at 7.2% compounded monthly for 20 years to buy a house.

- (a) Find their future value of the investment.
- (b) Over the 20 years, how much interest will they earn?

10.(10p) Pat invests \$7,500 for 18 months at an annual simple interest rate of 8.2%. What will be the balance of Pat's account after the 18 months? (Round answer to the nearest cent.)

11.(20p) Suppose an individual deposits \$10,500 in an account that earns 6%, compounded quarterly, and makes additional deposits of \$400 at the end of each quarter for the next 22 years until retirement. After retirement, this individual wants to make withdrawals at the end of each quarter for the next 12 years (at which time the account balance will be \$0).

- (a) (5p) How much is in the account after the last deposit is made?
- (b) (5p) How much was deposited?
- (c) (5p) What is the amount of each withdrawal?
- (d) (5p) What is the total amount withdrawn?

12.(10p) The estimated monthly profit realizable by a camera manufacturer for producing and selling x units is given by $P(x) = -0.04x^2 + 240x - 20,000$ dollars.

- (a) (5p) How many cameras should be produced in order to maximize profit?
- (b) (5p) What is the maximum monthly profit?