

# Homework 6 - Due 5 October 2011

## Math 1140 Financial Mathematics

**Collaboration Policy:** You are encouraged to collaborate with your fellow students on this homework. You must turn in individual solutions and you are not allowed to use any written, typed, or recorded artifact from the meeting with your classmates.

**Pledge:** On my honor, I pledge that I have neither given nor received unauthorized aid on this assignment.

**Name(use block letters):**

**Signature:**

**For full credit you must show your work and your calculations for all the problems.** I am not asking for the presentation of silly arithmetic!

**If you solve all the bonus problems you are not required to turn in the textbook problems (problem 4). I encourage you to check you can actually solve them.**

### Problem 1

Solve the inequality  $3x + 9 < 2x + 1$ .

### Problem 2

a) Prove that  $x^2 \geq 0$  for all numbers  $x$ .

*Hint:* Consider two cases:  $x \geq 0$  and  $x < 0$ .

b) Explain why we can't take the square root of a negative numbers.

### Problem 3

Prove  $(x^n)^m = x^{nm}$  for all numbers  $x$  and all natural numbers  $n$  and  $m$ .

*Observation:* Any number raised to the power zero is equal to 1. In mathematical notation, we write  $x^0 = 1$  for all numbers  $x$ .

### Problem 4 (Not required if you solve the bonus problems)

Solve the following exercises from textbook:

Page 72, exercises 14, 20

Page 76, exercise 1

Page 87, exercises 1, 10, 12, 16, 20

Page 91, exercises 1, 7, 10

Page 95, exercises 10, 12

Page 98, exercises 3, 8, 14, 18, 20

**Bonus problems on the back**

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### **Problem Bonus 1**

Solve the following exercises from textbook:

Page 92, exercise 21

Page 94, exercise 3

### **Problem (Bonus 2)**

Read the following article Probabilistic Auctions: Why Don't Universities Raffle off Chair Endowments?(the link is available on the class website).

a) Calculate the effective interest rate for Ben Franklin's investment. I am asking for the interest rate per conversion period for a compound interest loan with conversion period of one year.

b) Explain the 'concept' of 'probabilistic chair'.

### **Problem (Bonus 3)**

Read the following article Just the Facts: S&P's \$2 Trillion Mistake and explain, in your own words, the mistake made by Standard and Poors (S&P) and the consequences of that mistake.

### **Problem (Bonus 4)**

Alice takes a \$180,000 compound interest loan for 30 years, converted monthly, at an effective interest rate of 3%. Assuming a monthly payment of \$758.89, calculate after how long more than half of the monthly payment goes to paying the principal. Find the minimal number of months.