Final Exam, May 2 — 5 questions. All sub-questions carry equal weight.

1. (15%) Assume that income follows the AR(2) process

$$y_t = 0.5y_{t-1} + 0.5y_{t-2} + e_t \quad (*)$$

where e_t is white noise with variance 3.

i) Is the model stable (you need to show why or why not)?
ii) What is conditional variance of y_2 if you condition on $y_0, y_{-1}, ...$
iii) What is $E_1 y_t$ if $y_1 = 4$ and $y_0 = 4$?.

2. (30%) A consumer lives for 2 periods and earns $Y_1 = 20$\$$ in period 1, and in period 2 he or she earns X where X is normally distributed with mean 30 and variance 2. The consumer starts with 0 assets and maximizes

$$U(C_1) + \frac{1}{1.10} E_1 U(C_2) ,$$

where

$$U(C) = 100C - \frac{1}{2}C^2 .$$

Assume that the safe rate of interest is 10 percent.

a) Let B denote the amount lent in period 1 (or, equivalently, the amount of a safe bond bought). Assuming that the agent doesn't have access to any other assets, find B and the consumption in each period (for period 2, that means the consumption plan listing the distribution of consumption in period 2.)

b) Now assume that a stock (equity) exists besides the safe bond. Let the amount of equity bought be S (it can be negative). Assume that the stock has a net rate of return r_2^s with mean 0.20 and $E\{(r^s)^2)\} = 0.01$ and with $E(r^s, X) = 7$, when r^s is measured as a fraction).

Write down two equations in two unknowns that determine B and S. [A full answer use the given "correlations" to get two equations that only contains B and S.]

PLEASE TURN OVER

3. (30%) Consider the case of a 2 agents ("Home" and "Foreign"), 2 periods, 3 states-of-the-world model where agents can trade using a full set of Arrow securities. Assume that both agents have exponential utility functions $U(C_0) + E_0 U(C_1)$, where $U(C_t) = -\exp(-C_t)$.
Assume that the endowment of the first agent is $y_0 = 3$ and that the endowment of the second agent in period 0 is $y_0^* = 3$

The following table gives the possible endowments and the probabilities for Home and Foreign:

State of the world:	Home			Foreign		
	A	B	C	A	B	C
period 1 endowment	2	7	4	4	7	2
probability:	.25	.5	.25	.25	.5	.25

a) Find the prices of the Arrow-Debreu assets for each of the 3 states of the world.
b) Find the rate of interest. Explain in economic terms why it is positive or negative.
c) Assume that now only bonds can be traded. Find the rate of interest?
d) Explain in economic terms why the rate of interest would change or not change?

4. (15%) a) Explain carefully the logic of the Lucas imperfect information model and its implications for monetary policy. You do not need to do any mathematical manipulations but the explanations have to be clear.

5. (10%) *Explain* what is meant by the equity premium puzzle. (You do not need to *derive* the relation in the book, but you should explain what we assume about utility functions etc. and explain clearly. You do not need to remember exact numbers from the book.)