

(20%)1. Consider the Solow growth model with no technological change. Assume the growth rate of population is  $g = 0.15$  and the saving rate is  $s = 0.2$ . The production function is of form  $Y_t = AK_t^{1/3}L_t^{2/3}$ .

- What is the growth rate of this economy in the steady state?
- What is the per capita growth rate in the steady state?
- Now suppose that this country is already at the steady state, all of a sudden, the saving rate in this country changes to  $s' = 0.15$  due to some exogenous shock. What will change in response to the change in saving rate? Will the growth rate in the steady state change? Briefly describe the dynamic of capital per capita in this economy after the change in saving rate.
- Two countries have this same production function, and there is no technological change. The country with higher growth rate of population, has a higher growth rate of output and capital, hence has a higher level of steady state capital per capita.

(20%)2. The following is a simplified bank balance sheet (Millions of Dollars) with two dirty inky spots.

Assets		Liabilities	
Cash (including deposits held at Fed)	15	Checkable deposits	30
Loans	60	Other deposits	●
Securities	●	Shareholder's Equity	15
Other assets	8		
Total	100	Total	100

- Suppose the required reserve ratio is 10%, what is the amount of total *required* reserves in this bank? What is the amount of its *excess* reserve?
- Suppose this bank is the only depository bank in this country, what is the money base in this country?
- Suppose the ratio of currency to deposits is 40%, and the Fed increases money base by \$5m through Open Market Operation, that is buy government bond and pay Fed Funds. Note that securities in the bank balance sheet include government bonds held at bank. What is the increase in deposit? What is the increase in currency? What is the increase in total money supply? How much is the money multiplier?
- Rewrite the balance sheet of this bank after the OMO. Suppose that all the increase in the deposits is in term of checkable deposits. Check the balance sheet is indeed balanced, that is the total assets equals the total liabilities.

(10%) 3. In the efficiency wage theory, suppose that firms' mark-up over costs is 5% and the wage-setting equation is  $W = P(1-U)$  where  $U$  is the unemployment rate.

- What is the real wage rate?
- What is the natural rate of unemployment?
- If the mark-up of prices over costs increases to 10%, what happens to the natural rate of unemployment? Explain the intuition behind your answer.

(10%) 4. A virus killed more than half the oysters used to produce pearls in the world's busiest undersea factory. This makes the price of pearls used in earrings rise 18%. Use a diagram to explain this phenomenon. Can you infer anything about the elasticities of demand or supply from this information? According to Lynn Ramsey, president of the Jewelry Information Center in New York, "Price is not an object in this market." What do you think she means by this statement? Is this statement consistent with the evidence?

(20%) 5. Assume that a consumer has an income of \$30,000 that he spends on air travel,  $Y$ , and all other goods  $X$ . Assume  $P_X = 1$ . Suppose that the price for each mile of the first 10,000 miles of air travel is \$2 per mile. A frequent traveler program gives a 50% discount to travelers for every mile above 10,000 miles. Can you draw the budget constraint and find the equations that define each part of it? Suppose that the consumer's utility function is  $U = xy$ . Can you calculate and show on the diagram the optimal choice of the consumer? Show how it is possible that a consumer with different but still convex indifferent curves could be indifferent between two different optimal choices.

(10%) 6. The demand curve facing a monopoly is  $p = 100 - Q$ . The firm's cost curve is  $C(Q) = 10 + 5Q$ . What is the monopoly's profit-maximizing solution? What is its profit? Should the firm produce at all? How would your answers change if the monopoly's cost function were  $C(Q) = 2500 + 5Q$ ?

(10%) 7. Two pigs are put in a box with a food dispenser at one end and a panel at the other end. When the panel is pressed, the pig that presses it loses the utility of two units, and 10 units of food are dispensed. Because it takes time to press the panel, the pig that presses the panel arrives at the dispenser second. If they press the panel simultaneously, they arrive to the dispenser at the same time. Pig no. 1 is "dominant". If it gets to the dispenser first, the other pig gets only the leftovers, which are worth one unit. If both arrive at the same time, the dominant one eats 7 units. If the small pig gets there first, it eats 4 units of food. Assume that each pig has two strategies: (i) press the panel; and (ii) wait. Are there dominant strategies? Identify any non-cooperative equilibria.