Econ 102: Principles of Macroeconomics
Homework 4 (Page 1 out of 6)

Problem 1 (Present Value)
Suppose you own a bond that promises to pay you $100 next year, $100 two years from now, and $1000 in three years from now.

a. What is the market price of this bond if the market nominal interest rate is 5%? (HINT: you are asked to calculate the present value of these payments, which is the market price of the bond…)

Your answer:

b. What is the market price of this bond if the market nominal interest rate is 10%?

Your answer:

c. Based on the calculation you made in points A and B answer what happens to the market price of a bond if the market nominal interest rate rises.

Circle the answer: increases falls

d. Suppose you are pressed to sell your bond in the market to finance your honeymoon. Would you be better off if the Federal Reserve Bank's policy resulted in an increase in the market nominal interest rate or a fall?

Circle the answer: increase fall

Problem 2 (Production Function)

The production function in Wonderland is given by $Y = A\sqrt{KL}$, where *A* is the level of technology, *K* is capital input, *L* is labor input, and *Y* is output (real GDP).

a. Fix the technology level at A=1. Fill in the missing values in the table below by calculating output *Y* for each combination of inputs. (HINT: Use symmetry to fill out some of the missing values.)

	K=10	*K=20*	*K=30*	*K=40*	*K=50*
L=10	10			20	
L=20		20			
L=30			30		
L=40	20			40	
L=50					50

b. Does the production function exhibit diminishing returns to labor?

Your answer:

c. Does the production function exhibit diminishing returns to capital?

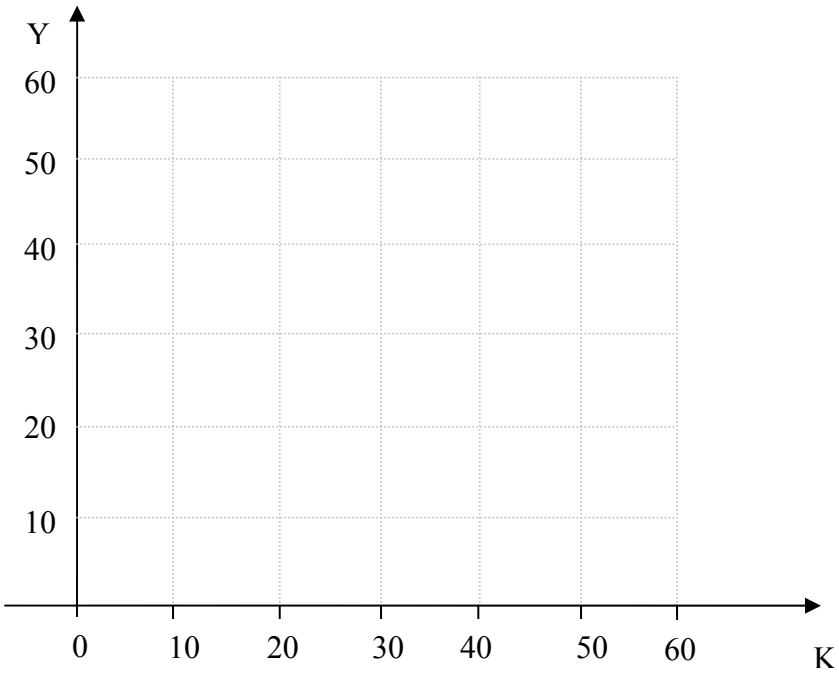
Your answer:

d. What happens with production when the technology gets better, i.e. A goes up?

Your answer:

e. Fix labor at L=10, and technology at A=1. Using the values you calculated in point a, plot output *Y* for the indicated levels of capital in the figure below.

 Your answer:



Problem 3 (Law of Motion for Capital)

Suppose that every period 10% of capital in the country of Wonderland depreciates (wears out in production due to aging).

a. Suppose initially there are 40 units of capital (K) in Wonderland. How much capital will Wonderland have after one period, if no investment is made to replace the depreciated capital with new capital?

 Your answer:

b. Refers to point a above. Suppose instead that the investment to replace depreciating capital is equal 2 (not 0 as in point A). How much capital will Wonderland have after one period? Is it more or less than it had initially (i.e. more or less than 40)?

Your answer:

c. Refers to point a above. Suppose instead that the investment to replace depreciating capital is equal 8. How much capital will Wonderland have after one period? Is it more or less than initially (i.e. more or less than 40)?

Your answer:

d. Suppose the production function in Wonderland is $Y = \sqrt{KL}$, where K is capital input, L is labor input (population) and Y is output. Suppose L=10, and assume that investment in capital is always equal to 40% of output Y that Wonderland produces in any given period (i.e. saving rate s is .4 and there are no taxes, i.e. T=0). For example, in the first period Wonderland has 40 units of capital, thus investment is 40% of $Y = \sqrt{400} = 20$, which is equal to 8 units (like in point C above). Depreciation rate of capital is 10%. Given this information, fill in the missing values in the table below:

Your answer:

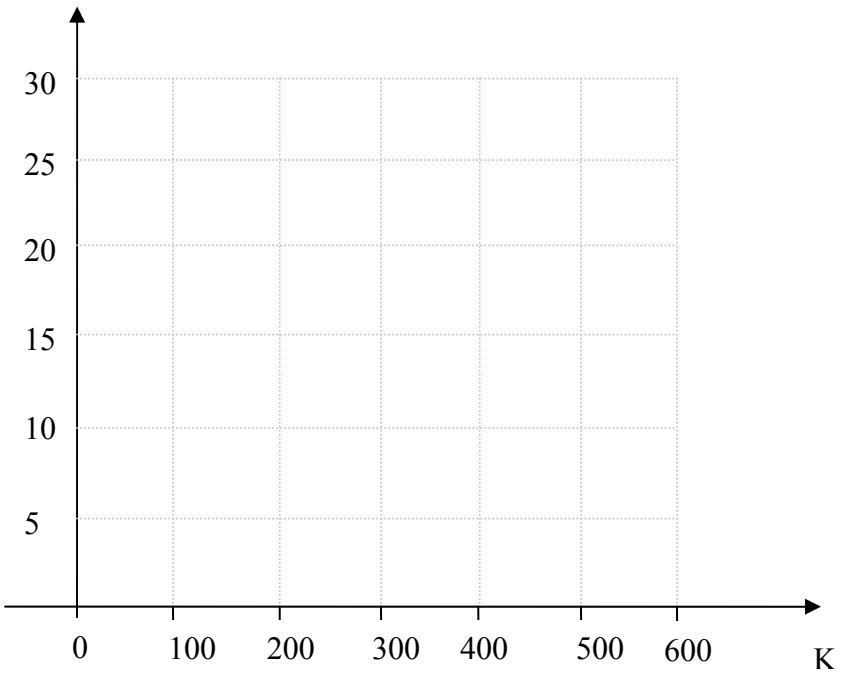
Period	Capital	Output	Depreciated Capital	Investment in formation of capital (=savings)
1	40	20	4	8
2	44			
3				

e. Refers to the data in point d above. Fill in the missing values in the table below:

Your answer:

(1) Capital *K*	(2) Output Y	(3) Investment in formation of capital (=savings)	(4) Depreciation of capital δK
10	$10=10^{1/2}x10^{1/2}$	.4*10=4	10% of 10 = 1
100	$....=100^{1/2}x10^{1/2}$		10% of 100=10
200			20
300			
400			
500			

f. Using the data in the table above (column 3 and 4), plot the investment line (column 3) and depreciation line (column 4). Mark clearly the range of capital for which investment in new capital is above depreciation of capital (i.e. where capital grows over time), and the range of capital K for which the opposite is true (i.e. where capital falls over time).



g. What is the key property of the point where the investment line crosses the depreciation line? (HINT: What happens with capital over time, presuming we start from the point where the two lines intersect?)

 Your answer: