1. Consider a variant of the two-period model of consumption-saving behavior. In this version of the model, the consumer has income *y* in the first period and no income in the second period. Her life-time budget constraint is



* 1. Draw this budget constraint in a diagram with *c* on horizontal axis and *c*’ on vertical axis. What are the slope and vertical intercept of this budget constraint? Label the endowment point in the diagram. (3 points)
	2. Suppose the consumer faces the above budget constraint and has regular, convex indifference curves. If the interest rate increases, show in a diagram how her equilibrium will change. In the same diagram, decompose the overall effect on *c*’ into income and substitution effects. (3 points)
	3. Suppose the consumer faces the above budget constraint and has *L-*shaped indifference curves. She prefers to have the same consumption in the two periods. If the interest rate increases, show in a diagram how her equilibrium will change. In the same diagram, decompose the overall effect on *c*’ into income and substitution effects. What is the intuition behind the income and substitution effects that you have found? (4 points)

[Question 1 total points: 10]

1. Consider the two-period endogenous growth model with human capital. The production function is

*Y* = *z* (*uH*)^alpha ,

where *Y* is output, *z* is productivity, *u* is the fraction of human capital devoted to the production of output, *H* is human capital and (alpha) E (0*;*1) is a parameter. Human capital evolves according to

 *H*0 = *b*[(1-*u*)*H*]^beta ,

where *H*’ is the next-period human capital, *b >* 0 is a parameter, (1-*u*) is the fraction of human capital devoted to the accumulation of human capital and (beta) *>* 0 is a parameter.

* 1. The growth rate of human capital is. Find *gH* as a function of *b*, *u*, *H* and beta. If *H* increased, what would happen to *gH*? (3 points)
	2. For this part only, assume (beta) E (0*;*1). Based on the expression for *gH* that you have derived in part (*a*), find the steady-state expression for *H*.

[Hint: The economy is in a steady state when *gH* = 0.] (2 points)

* 1. The problem of the consumer is to choose *u* to maximize

*U* = ln*C* + ln*C’*

subject to *Y* = *z* (*uH*)^alpha *; Y’* = *z*’ (*u*’*H*’)^alpha and *H*’ = *b*[(1 *u*)*H*]^beta . All variables with a prime (‘) are next-period variables. Assume *u*’ = 1. Find an expression for the optimal *u* and provide an intuitive explanation for it. [Hint: Use the equilibrium conditions *Y* = *C* and *Y’* = *C*’.] (5 points) [Question 2 total points: 10]

1. In the real intertemporal model that we did in the class, we assumed that an increase in the real interest rate (*r*) would increase labor supply *NS* . In this problem, we assume that an increase in the real interest rate *decreases* labor supply.
	1. Explain this assumption in the light of income and substitution effects of an increase in the real interest rate. (2 points)
	2. Derive the output-supply curve under the new assumption that an increase in the real interest rate *decreases* labor supply. Draw the following three diagrams to answer this part: 1) the labor market; 2) the production function; and 3) the output-supply curve. (4 points)
	3. Suppose that the output-supply curve that you have derived in part (b) is fl*atter* than the output-demand curve. Now suppose that the output demand curve shifts to the right. What would happen to the equilibrium real interest rate and output? Show both the initial and new equilibria in an output-demand and output-supply diagram. (2 points)
	4. Suppose that the output-supply curve that you have derived in part (b) is *steeper* than the output-demand curve. Now suppose that the output demand curve shifts to the right. What would happen to the equilibrium real interest rate and output? Show both the initial and new equilibria in an output-demand and output-supply diagram. (2 points)

[Question 3 total points: 10]

*Question 4 is on the next page* ...

1. Use the monetary intertemporal model to show the effects of an increase in capital stock (*K*) on the economy. Assume that the monetary-policy goal of the central bank is to keep the price level constant. Also assume that the equilibrium output increases due to the net effect of the increase in capital stock. Draw all five *inter-connected* diagrams and provide a brief explanation for changes in each diagram. Each diagram is worth 2 points.

[Question 4 total points: 10]

*Question 5 is on the next page* ...

1. The Coronavirus pandemic is likely to affect the Canadian economy in a number of ways. For this problem, assume that it has the following three effects on the Canadian economy: 1) Autonomous consumption and investment decrease; 2) the world interest rate decreases; and 3) there is a temporary decline in productivity. Use the small-open-economy monetary intertemporal model to study the effects of these shocks on the Canadian economy, which has a flexible exchange rate. Assume that the demand-side shock to consumption and investment is larger than the supply-side shock due to lower productivity. Also assume that the drop in the world interest rate is greater than the drop implied by the initial shifts in the output-demand and output-supply curves. Draw all five *inter-connected* diagrams and provide a brief explanation for changes in each diagram. Each diagram is worth 2 points.

[Question 5 total points: 10]