Name _____   Student ID _____   TA or section_____

Midterm 1 - Economics 101 (Spring 2025)
You will have 75 minutes to complete this exam. There are 43 points.

Multiple Choice: (10 points total, 1 points each) Choose the best answer. Write on your scantron.

MC#1 The CPI is determined by computing:
- A)   real GDP divided by nominal GDP
- B)   an average of prices of all goods and services produced in an economy.
- C)   the price of a fixed basket of consumption goods and services, relative to the price of the same basket in a base year.
- D)   nominal GDP divided by real GDP.

MC#2 Which of the following properties does this production function exhibit*: Y = 8K$^{0.25}$L$^{0.75}$*
- A)   diminishing marginal product of labor
- B)   diminishing marginal product of capital
- C)   constant returns to scale
- D)   all of the above
- E)   none of the above

MC#3 In a Neoclassical model where consumption and investment both are negative functions of the real interest rate, the "crowding out" of investment due to a rise in government spending will be ____ compared to a case where consumption does not depend on the interest rate.
- A)   smaller
- B)   larger
- C)   the same
- D)   the opposite sign

MC#4 According to Euler's theorem, if competitive firms pay each factor its marginal product and the production function has constant returns to scale, the sum of all factor payments will equal:
- A)   total saving.
- B)   total output.
- C)   total investment.
- D)   total profits.

MC#5 When prices of different goods are increasing by different amounts, the price index that will tend to rise the faster due to substitution bias is:
- A)   the GDP deflator.
- B)   GDP
- C)   the CPI.
- D)   real interest rate.

MC#6 In equilibrium of the Neoclassical model, total investment equals:
    A)   Real interest rate
    B)   National saving
    C)   Level of capital stock
    D)   Depreciation rate

MC#7 If nominal GDP grew by 8 percent and real GDP grew by 3 percent, then the GDP deflator grew by approximately _____ percent.
    A)   5
    B)   3
    C)   11
    D)   8

MC#8 In the Neoclassical model, which of the following adjusts to make supply equal demand in the goods market:
    A)   Goods price level
    B)   Real rental rate
    C)   Real wage
    D)   Real interest rate

MC#9 In the Solow model with population growth rate n, and technological progress rate g, the steady-state growth rate of total output (not per person) is:
    A)   0
    B) $n+g$
    C) n
    D) g

MC10 In an economy with no population growth and no technological progress, steady-state consumption in the Solow model is at its greatest possible level when the steady state marginal product of:
    A)   capital equals zero.
    B)   labor equals the marginal product of capital.
    C)   labor equals the depreciation rate.
    D)   capital equals the depreciation rate.

Problem 1: Neoclassical Model (10 points total)

Suppose an economy characterized as follows:

Production:	$Y = 5K + 3L$	
Factor supply:	$K = 100$	$L = 200$
Government:	$G = 100$	$T = 300$
Consumer behavior:	$C = 150 + 0.5(Y-T)$	
Investment behavior:	$I = 600 - 1000r$	

(Y is real GDP, K capital, L labor, G government purchases, T taxes, C consumption, I investment, r real interest rate.)

a) (3 points) Solve for the equilibrium real interest rate. (Show your work.)

b) (4 points) Suppose the government <u>lowers</u> spending relative to what was assumed above. Graphically represent the effect of this change on the supply and demand curves in the financial market on the axes below. Label each curve, and show with an arrow any curve shift. (Note that consumption is <u>not</u> a function of the interest rate in the equations above.)

r

I,S

Explain in a couple of sentences the <u>economic logic for why</u> the interest rate must change the way it does (points awarded for completeness).

c) (3 points) Suppose instead <u>a rise in tax, T</u> (no change in government spending here). What effect will this have on the variables listed below? <u>Mark on scantron</u>.

MC#11: consumption	(a) rise	(b) fall	(c) no change	(d) insufficient information
MC#12: real interest rate	(a) rise	(b) fall	(c) no change	(d) insufficient information
MC#13: investment	(a) rise	(b) fall	(c) no change	(d) insufficient information

Problem 2: Neoclassical Factors Market (11 points total)

Suppose an economy with:

Production:	$Y = 15\ K^{1/3}\ L^{2/3}$	
Fixed factor supplies:	$K = 1000$	$L = 1000$

(Y is real GDP, K capital, L labor)

a) (4 points) Compute the equilibrium levels of the real wage and real rental rate on capital. (Show your work. You may continue on the next page.)

b) (3 points) Suppose immigration increases the size of the labor force, L. What effect will this have on the real wage in this model? Explain in a couple of sentences the economic reasoning for why, and what assumptions of this model generate this result.

c) (1 point each MC item) <u>Mark on Scantron</u>. No explanation required.
Suppose a war destroys part of the capital stock in this economy (but the labor force remains at 1000). How will this affect the following:
MC#14: real rental rate of capital
    (a) rise   (b) fall   (c) no change   (d) insufficient information
MC#15: total payments to capital (real rental rate x K). (If you don't remember, you can find the answer by working through the math.)
    (a) rise   (b) fall   (c) no change   (d) insufficient information
MC#16: the share of total income paid to capital (real rental rate x K / Y. (If you don't remember, you can find the answer by working through the math.)
    (a) rise   (b) fall   (c) no change   (d) insufficient information
MC#17: real wage
    (a) rise   (b) fall   (c) no change   (d) insufficient information

Problem 3: Solow Growth Model: (12 points total)

Equations for the Solow growth model (assuming no technological progress):

Steady state condition: $sf(k) = (\delta + n)k$

Golden rule condition: $MPK = \delta + n$

a) (6 points) Suppose an economy with production function in per person terms $y = 2k^{1/2}$, a saving rate of 10%, depreciation rate of 20%, and no population growth rate or technological progress.

Compute the following (show your work):
i) steady state level of capital per person
ii) golden rule level of capital per person.

iii) Explain in a couple of sentences the economic reason why your answers to (i) and (ii) are not the same. (Points awarded for completeness.)

b) (3 points) Suppose the country <u>raises</u> its saving rate above 10%. Using the Solow growth model, draw a graph of the investment and depreciation lines to show how the change in saving rate affects the <u>steady state</u> capital stock per person. (Assume no technological progress or population growth.) Label curves, and use arrows to indicate any curve shifts. Label the initial steady state level of capital per person as $k_1{}^*$, and label as $k_2{}^*$ the steady state for the new saving rate.

investment
and
depreciation

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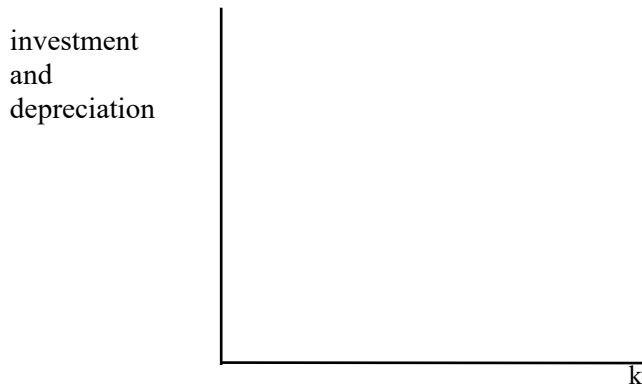
c) (3 points) How does a <u>fall in population growth rate</u> affect the following variables in the Solow model with population growth? <u>Mark on scantron</u>.
MC#18: steady state output per person
 (a) rise   (b) fall   (c) no change   (d) insufficient information
MC#19: steady state growth rate in total output
 (a) rise   (b) fall   (c) no change   (d) insufficient information
MC#20: golden rule level of capital stock per person
 (a) rise   (b) fall   (c) no change   (d) insufficient information

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