

Intermediate Macroeconomics 311

Final Exam, March 13, 2023

Note: This is a closed book exam. You may use calculators.

SECTION/TA: _____

YOUR NAME: _____

NetID: _____

Directions: Answer each of the following questions. Show all your work for the open questions. Write your answers to the multiple choice questions in the grid below.

Multiple Choice Questions' Answer Grid

Answers outside the grid will not be graded!

1	A	21	D	41	B
2	A	22	A	42	C
3	B	23	E	43	C
4	B	24	B	44	B
5	B	25	B	45	C
6	D	26	C	46	C
7	C	27	C	47	C
8	B	28	A	48	A
9	A	29	B	49	D
10	A	30	D	50	D
11	A	31	D	51	B
12	C	32	A	52	D
13	A	33	B	53	D
14	D	34	C	54	B
15	B	35	B	55	C
16	A	36	C	56	C
17	B	37	D	57	C
18	A	38	B	58	B
19	B	39	C	59	A
20	B	40	C	60	B

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Multiple Choice Questions

- 1) In the Solow model, if the economy starts with more capital per worker than the steady-state level of capital per worker, then the capital per worker will _____ and the output per worker will _____ as the economy approaches steady state.
 - a) fall; fall
 - b) fall; rise
 - c) rise; fall
 - d) rise; rise

- 2) Which of the following was not a connection between the Asian financial crisis of 1997-98 and the unusual emergence of a U.S. government budget surplus in 1998-2001?
 - a) rising U.S. net exports
 - b) capital outflows from Asia to the U.S.
 - c) soaring U.S. stock prices in 1996-2000
 - d) U.S. capital gains tax revenues

- 3) When a firm sells a product out of inventory, investment expenditures _____, and consumption expenditures _____.
 - a) increase; decrease
 - b) decrease; increase
 - c) decrease; remain unchanged
 - d) remain unchanged; increase

- 4) If $Y = K^{0.3}L^{0.7}$, then the per-worker production function is:
 - a) $Y = F(K / L)$.
 - b) $Y / L = (K / L)^{0.3}$.
 - c) $Y / L = (K / L)^{0.5}$.
 - d) $Y / L = (K / L)^{0.7}$.

- 5) Examination of recent data for many countries shows that countries with high saving rates generally have high levels of output per person because:
 - a) high saving rates mean permanently higher growth rates of output.
 - b) high saving rates lead to high levels of capital per worker.
 - c) countries with high levels of output per worker can afford to save a lot.
 - d) countries with large amounts of natural resources have both high output levels and high saving rates.

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- 6) In a classical model with fixed factors of production and flexible prices, the amount of consumption spending depends on _____, the amount of investment spending depends on _____, and the amount of government spending is determined _____.
- the interest rate; disposable income; by tax revenue
 - the real wage; the real rental price of capital; by factor prices
 - labor's share of output; capital's share of output; by the interest rate
 - disposable income; the interest rate; exogenously
- 7) Empirical results justify substantial government subsidies to research based on the finding that the:
- private return to research is greater than the social return to research.
 - private return to research is approximately equal to the social return to research.
 - private return to research is less than the social return to research.
 - private return to research is positive, but the social return to research is negative.
- 8) The endogenous growth model's assumption of constant returns to capital is more plausible if capital is defined to include:
- plant and equipment.
 - knowledge.
 - depreciation.
 - natural resources
- 9) Which of the following accounts for most of the difference between the unemployment rate concepts U-3 and U-6?
- involuntary part-time employment
 - structural unemployment
 - frictional unemployment
 - involuntary unemployment
- 10) In a steady state with population growth and technological progress:
- the real rental price of capital is constant and the real wage grows at the rate of technological progress.
 - the real rental price of capital grows at the rate of technological progress and the real wage is constant.
 - both the real rental price of capital and the real wage grow at the rate of technological progress.
 - both the real rental price of capital and the real wage are constant.
- 11) Which of these statements is NOT true about the creation of knowledge and the process of research and development?
- Knowledge is a private good, that is, rival and excludable.
 - Much of the research and development is done by firms driven by the profit motive.
 - Patents provide firms with monopoly power that makes research profitable.
 - Most innovations build on previous innovations.

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- 12) One explanation for greater economic development in moderate versus tropical climates is that institutions established by colonial settlers in moderate climates _____, while institutions established by colonists in tropical climates _____.
- a) were based on English common law; were based on the Napoleonic Code
 - b) were based on the Napoleonic Code; were based on English common law
 - c) protected property rights; were extractive and authoritarian
 - d) were extractive and authoritarian; protected property rights
- 13) The majority of empirical evidence supports the hypothesis that economies that are open to trade _____ than comparable closed economies.
- a) grow more rapidly
 - b) have lower steady-state levels of income per worker due to foreign competition
 - c) have faster rates of population growth and technological progress
 - d) converge more slowly to a steady-state equilibrium
- 14) Suppose an economy is at its steady-state equilibrium and there is a permanent reduction in the saving rate of the economy. In this case, as the economy approaches its new steady state, capital per worker will _____ and output per worker will _____.
- a) rise; rise
 - b) rise; fall
 - c) fall; rise
 - d) fall; fall
- 15) The type of legal system and the level of corruption in a country have been found to be:
- a) unrelated to the rate of economic growth in a country.
 - b) significant determinants of the rate of economic growth in a country.
 - c) important topics for political discussion, but not economic explanations of growth.
 - d) important variables explaining the Golden Rule level of capital.
- 16) If the government's tax revenue is more than what it spends, then the government runs a budget _____ and the national saving will be _____ than private saving.
- a) surplus; higher
 - b) surplus; lower
 - c) deficit; higher
 - d) deficit; lower

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- 17) The introduction of a stylish new line of Toyotas, which makes some consumers prefer foreign cars over domestic cars, will, according to the Mundell–Fleming model with floating exchange rates, lead to:
- a) a fall in income and net exports.
 - b) no change in income or net exports.
 - c) a fall in income but no change in net exports.
 - d) no change in income but a fall in net exports.
- 18) Suppose for an economy the capital stock is 6 times one year's GDP and the capital income is 30 percent of GDP. In this case, we can conclude that the marginal product of capital is equal to _____ percent per year.
- a) 5
 - b) 10
 - c) 15
 - d) 20
- 19) Public policy to increase the job finding rate includes _____, and public policy to decrease the job separation rate includes _____.
- a) government employment agencies; higher unemployment insurance benefits
 - b) government employment agencies; 100 percent experience-rated unemployment insurance
 - c) higher minimum wage laws; payment of unemployment benefits for longer periods
 - d) higher efficiency wages; partially experience-rated unemployment insurance
- 20) In the Mundell–Fleming model with a fixed exchange rate, a rise in the world interest rate will lead income:
- a) and net exports both to fall.
 - b) to fall while net exports are unchanged.
 - c) to be unchanged and net exports to fall.
 - d) and net exports to both be unchanged.
- 21) The unemployment resulting when real wages are held above equilibrium is called _____ unemployment, while the unemployment that occurs as workers search for a job that best suits their skills is called _____ unemployment.
- a) efficiency; inefficiency
 - b) efficiency; structural
 - c) frictional; efficiency
 - d) structural; frictional

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- 22) Between 1929 and 1933 the nominal interest rate declined. This suggests that the main cause of the Great Depression was not a decline in:
- a) nominal money supply
 - b) price level
 - c) aggregate expenditures
 - d) fiscal policy
- 23) The primary cause of inflation in the U.S. in 2021-22 was:
- a) fiscal stimulus
 - b) shift from services to goods spending
 - c) production shortages of goods
 - d) a) and c)
 - e) a), b), and c)
- 24) The introduction of automatic teller machines, which reduces the demand for money, will, according to the Mundell–Fleming model with fixed exchange rates, lead to:
- a) a rise in income and net exports.
 - b) no change in income or net exports.
 - c) no change in income but a rise in net exports.
 - d) a rise in income but no change in net exports.
- 25) In the Mundell–Fleming model with flexible exchange rates, an increase in the price level results in a(n) _____ in the real exchange rate and a(n) _____ in net exports.
- a) increase; increase
 - b) increase; decrease
 - c) decrease; decrease
 - d) decrease; increase
- 26) When an economy's capital is below the Golden Rule level, reaching the Golden Rule level:
- a) produces lower consumption at all times in the future.
 - b) requires higher consumption levels at all times.
 - c) requires initially reducing consumption to increase consumption in the future.
 - d) requires initially increasing consumption to decrease consumption in the future.
- 27) If a country chooses to have free capital flows and to maintain a fixed exchange rate, then it must:
- a) live with exchange-rate volatility.
 - b) restrict its citizens from participating in world financial markets.
 - c) give up the use of monetary policy for purposes of domestic stabilization.
 - d) give up the use of fiscal policy for purposes of domestic stabilization.

- 28) In this course South Korea was used to illustrate each of the following except which one?
- a) extractive institutions
 - b) growth compared to the Philippines
 - c) Asian financial crisis
 - d) satellite imagery at night
- 29) If only unanticipated changes in the money supply affect real GDP, the public has rational expectations, and everyone has the same information about the state of the economy, then:
- a) monetary policy can be used to systematically stabilize output.
 - b) monetary policy cannot be used to systematically stabilize output.
 - c) a policy of keeping the money supply constant is optimal.
 - d) a policy of adjusting the money supply in response to the state of the economy is optimal.
- 30) In the sticky-price model, if no firms have flexible prices, the short-run aggregate supply schedule will:
- a) be vertical.
 - b) be steeper than it would be if some firms had flexible prices.
 - c) slope upward to the right.
 - d) be horizontal.
- 31) *Each* of these conditions will tend to reduce the sacrifice ratio EXCEPT when:
- a) workers and firms set wages and prices based on rational expectations.
 - b) policymakers make credible commitments to policy changes.
 - c) announcements of policy changes are made before workers and firms have formed expectations.
 - d) the concept of *hysteresis* accurately describes the impact of history on the natural rate of unemployment.
- 32) According to the natural-rate hypothesis, the levels of output and unemployment depend on:
- a) aggregate demand in the short run but not in the long run.
 - b) aggregate demand in the long run but not in the short run.
 - c) the natural rate of unemployment in the short run but the natural rate of inflation in the long run.
 - d) the natural rate of inflation in the short run but the natural rate of unemployment in the long run.
- 33) Banks create money in:
- a) a 100-percent-reserve banking system but not in a fractional-reserve banking system.
 - b) a fractional-reserve banking system but not in a 100-percent-reserve banking system.
 - c) both a 100-percent-reserve banking system and a fractional-reserve banking system.
 - d) neither a 100-percent-reserve banking system nor a fractional-reserve banking system.

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- 34) In the basic endogenous growth model, income can grow forever—even without exogenous technological progress—because:
- a) the saving rate equals the rate of depreciation.
 - b) the saving rate exceeds the rate of depreciation.
 - c) capital does not exhibit diminishing returns.
 - d) capital exhibits diminishing returns.
- 35) The Federal Funds rate was as high as 19 percent in _____ and as low as 0 percent in _____.
- a) 1971, 2020
 - b) 1981, 2010
 - c) 1991, 2000
 - d) 2001, 1990
- 36) A recession may alter an economy's natural rate of unemployment in *all* of these ways EXCEPT by:
- a) changing an unemployed individual's attitude toward work.
 - b) reducing an unemployed worker's job skills.
 - c) permanently reducing the money supply.
 - d) altering the wage-setting process.
- 37) Which of these combinations is NOT a U.S. president and an important economic issue of his administration?
- a) President Carter; inflation
 - b) President Reagan; budget deficits
 - c) President G. H. W. Bush; budget deficits
 - d) President Clinton; inflation
- 38) Endogenous variables are:
- a) fixed at the moment they enter the model.
 - b) determined within the model.
 - c) the inputs of the model.
 - d) from outside the model.
- 39) The article “Why the Fed Wants Workers to be Worse Off” made all of these points but the following:
- a) firms are reluctant to reduce nominal wages because it is bad for worker morale
 - b) inflation results from a distributional conflict between firms, workers, and taxpayers
 - c) low unemployment has given workers bargaining strength to raise real wages
 - d) reducing interest rates is an inefficient way to reduce inflation

- 40) Which statement BEST illustrates the "art," rather than the "science," of macroeconomics?
- a) Macroeconomic data provide the motivation for new macroeconomic theory.
 - b) Macroeconomic relationships can be expressed using symbols and equations.
 - c) Macroeconomists must determine which simplifying assumptions clarify our thinking and which ones mislead us.
 - d) Graphs and charts can be used to illustrate the history of macroeconomic variables.
- 41) Assume that a firm buys all the parts that it puts into an automobile for \$10,000, pays its workers \$10,000 to fabricate the automobile, and sells the automobile for \$22,000. In this case, the value added by the automobile company is:
- a) \$10,000.
 - b) \$12,000.
 - c) \$20,000.
 - d) \$22,000.
- 42) According to the article "Six Blunders," which of the following was not a cause of the 2008-09 financial crisis?
- a) sub-prime mortgages
 - b) unregulated securities trading
 - c) tight monetary policy
 - d) housing foreclosures
- 43) Assume that a rancher sells McDonald's a quarter-pound of meat for \$1 and that McDonald's sells you a hamburger made from that meat for \$2. In this case, gross domestic product (GDP) increases by:
- a) \$0.50.
 - b) \$1.
 - c) \$2.
 - d) \$3.
- 44) Government transfer payments:
- a) are included as part of government purchases, G .
 - b) can be viewed as negative tax payments, T .
 - c) are received as payment for inputs in the factor market.
 - d) do not affect the level of public or private saving.
- 45) Assuming that goods and factor markets are perfectly competitive, which one of these explains the increasing share of capital in national income?
- a) reduction in the bargaining power of workers as represented by the decline in union memberships
 - b) an increase in buying power of firms especially in the labor market
 - c) technological advancement that has decreased the role of labor and increased the role of capital in production
 - d) the ability of some firms to set prices above the marginal cost in a competitive market

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46) Which of the following countries had by far the fastest growth of per person GDP between 1870 and 2020?

- a) United Kingdom
- b) United States
- c) Japan
- d) Germany

47) A bank balance sheet consists of only these items:

Deposits	\$1,000
Reserves	\$100
Securities	\$400
Bonds Issued	\$500
Loans	\$2,000

What is the value of bank capital?

- a) -\$1,000
- b) +\$500
- c) +\$1,000
- d) +\$1,500

48) The time interval which best illustrates the negative Phillips Curve tradeoff is

- a) 1964-69
- b) 1974-79
- c) 1984-89
- d) 1994-99

49) Money's liquidity refers to the ease with which:

- a) coins can be melted down.
- b) illegally obtained money can be laundered.
- c) loans can be floated.
- d) money can be converted into goods and services.

50) On the convergence diagram plotting growth rates on the vertical and level of per-capita income in an initial year on the horizontal, the nations in the southwest corner of the diagram are located in _____ and then to have country populations that are _____ than average.

- a) Asia, larger
- b) sub-Saharan Africa, larger
- c) Asia, smaller
- d) Sub-Saharan Africa, smaller

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- 51) Consider the money demand function that takes the form $(M/P)^d = kY$, where M is the quantity of money, P is the price level, k is a constant, and Y is real output. If the money supply is growing at a 10 percent rate, real output is growing at a 3 percent rate, and k is constant, what is the average inflation rate in this economy?
- a) 3 percent
 - b) 7 percent
 - c) 10 percent
 - d) 13 percent
- 52) The right of seigniorage is the right to:
- a) levy taxes on the public.
 - b) borrow money from the public.
 - c) draft citizens into the armed forces.
 - d) create money.
- 53) The ratio of unfilled vacancies to unemployed persons in the 2023 U.S. economy is closest to the following:
- a) 0.5
 - b) 1.0
 - c) 1.5
 - d) 2.0
- 54) Using average rates of money growth and inflation in the United States over many decades, Friedman and Schwartz found that decades of high money growth tended to have _____ rates of inflation and decades of low money growth tended to have _____ rates of inflation.
- a) high; high
 - b) high; low
 - c) low; low
 - d) low; high
- 55) The real exchange rate is determined by the equality of:
- a) saving and the demand for net exports.
 - b) investment and the demand for net exports.
 - c) net capital outflow and the demand for net exports.
 - d) the negative value of net capital outflow and the demand for net exports.
- 56) The “Rio Grande Puzzle” is solved by all of the following factors except which one?
- a) political capital
 - b) infrastructure capital
 - c) human capital
 - d) geography

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- 57) The lower the real exchange rate is, the _____ expensive domestic goods are relative to foreign goods, and the _____ the demand is for net exports.
- a) more; greater
 - b) more; smaller
 - c) less; greater
 - d) less; smaller
- 58) If 5 Swiss francs trade for \$1, the U.S. price level equals \$1 for a good, and the Swiss price level equals 2 francs for the same good, then the real exchange rate between Swiss goods and U.S. goods is _____ Swiss good(s) per U.S. good.
- a) 0.4
 - b) 2.5
 - c) 5
 - d) 10
- 59) If the rate of separation is 0.02 and the rate of job finding is 0.08 but the current unemployment rate is 0.10, then the current unemployment rate is _____ the equilibrium rate, and in the next period it will move _____ the equilibrium rate.
- a) above; toward
 - b) above; away from
 - c) below; toward
 - d) below; away from
- 60) In a lecture featuring the growth performance of India and China, recent progress in India could be seen in:
- a) development of high-speed rail
 - b) manufacture of iPhones
 - c) elimination of female illiteracy
 - d) elimination of rural poverty

Open Questions**Question 1 (18 points)**

Consider a **closed** economy that is characterized by the following equations:

$$\begin{aligned}C &= 50 + \frac{1}{2}(Y - T), \\I &= 50 - 5r, \\G &= T = 0, \\ \left(\frac{M}{P}\right)^d &= 10 + Y - 2r, \\M &= 198, \\P &= 1.\end{aligned}$$

- a) Derive the IS and the LM curves and compute the equilibrium income and interest rate. (3 points)

Solution: The IS curve is

$$Y = 200 - 10r.$$

The LM curve is

$$Y = 188 + 2r.$$

It follows that equilibrium income is 190 and the equilibrium interest rate is 1.

Suppose that agents suddenly require more real money for the same level of income and interest rates, so that money demand is now

$$\left(\frac{M}{P}\right)^d = 22 + Y - 2r.$$

Consider also the two monetary policy alternatives:

- Money-supply targeting: “keep the money supply constant at $M = 198$ ”;
- Interest-rate targeting: “adjust money supply to keep the interest rate constant at $r = 1$ ”.

- b) Suppose the Fed commits to money-supply targeting. What is the effect on equilibrium income and interest rate? (3 points)

Solution: The IS curve is still

$$Y = 200 - 10r,$$

but the LM curve is now

$$Y = 176 + 2r.$$

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Equilibrium income is 180, and the equilibrium interest rate is 2.

- c) Suppose the Fed commits to interest-rate targeting. What is the effect on equilibrium income, interest rate, and money supply? (3 points)

Solution: The interest rate is 1. From the IS curve, we immediately get that equilibrium income is 190. From the LM curve, we get that

$$M = 22 + 190 - 2 = 210.$$

Suppose that money demand is as initially, but firms wish to invest more for the same interest rate, so that investment now takes the form

$$I = 56 - 5r.$$

- d) If the Fed commits to money-supply targeting, what is the effect on equilibrium income and interest rate? (3 points)

Solution: The IS curve is now

$$Y = 212 - 10r,$$

while the LM curve is still

$$Y = 188 + 2r.$$

Equilibrium income is 192, while the equilibrium interest rate is 2.

- e) If the Fed commits to interest-rate targeting, what is the effect on equilibrium income and interest rate, and money supply? (3 points)

Solution: Again, the interest rate is 1. From the IS curve, we immediately get that income is 202. From the LM curve, we get that money supply is 210.

- f) Compute the change in output brought about by **each** of the shocks above - the money demand and investment shocks – if:
- The Fed commits to the money supply rule (1 point)
 - The Fed commits to the interest rate rule (1 point)

Solution: With the LM shock, output decreased by 10 units with money-supply targeting, whereas it was constant with interest-rate targeting. With the IS shock, output increased by 2 units with money-supply targeting, whereas it increased by 12 units with interest-rate targeting.

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- g) Suppose that the goal of the Fed is to stabilize output, *i.e.*, to have output fluctuate the least possible. Based on the answer to the previous question, if the only shocks in the economy are shocks to the LM curve, should the Fed target money supply or the interest rate? What if the only shocks in the economy are shocks to the IS curve? (1 point)

Solution: With only LM shocks, the Fed should do interest-rate targeting in that case. With only IS shocks, the Fed should do money-supply targeting in that case.

Question 2 (12 points)

In an economy, the Phillips curve is

$$\pi_t = E\pi_t - \frac{1}{4}(u_t - 8),$$

where π_t is the inflation rate in period t , $E\pi_t$ are the people's expectations for inflation in period t , and u_t is the unemployment rate in period t . In this economy, Okun's law is

$$g_t = 3 - 2(u_t - u_{t-1}),$$

where g_t is the growth rate of real GDP. In this economy, people have adaptive expectations, so that

$$E\pi_t = \pi_{t-1}.$$

- a) What is the natural level of unemployment? (4 points)

Solution: The natural level of unemployment is 8.

- b) Suppose that $u_0 = u_{-1} = 8$, and $\pi_{-1} = 10$. Compute π_0 and g_0 . (4 points)

Solution: $\pi_0 = 10$ and $g_0 = 3$.

- c) Suppose there is a sharp but temporary increase in demand, so that $u_1 = 4$, but $u_2 = 8$. Complete the following table. (4 points)

t	u_t	π_t	g_t
0	8	10	3
1	4	12	11
2	8	10	-5

Question 3 (15 points)

Consider a **small open economy** characterized by the following equations:

$$\begin{aligned} C &= 100 + \frac{3}{4}(Y - T), \\ I &= 100 - 3r, \\ G &= 100, \\ T &= 100, \\ NX &= 100 - 20e, \\ \left(\frac{M}{P}\right)^d &= (Y - T) - 10r, \\ P &= 1, \\ r^* &= 3. \end{aligned}$$

Note that money demand depends on **disposable** income.

- a) Derive the IS* curve. (3 points)

Solution: The IS* curve is

$$Y = 1264 - 80e.$$

- b) Suppose that at the current equilibrium, is $M = 974$. Derive the LM* curve and compute the equilibrium income, exchange rate, consumption and net exports. (4 points)

Solution: The LM* curve is

$$Y = 1104.$$

So $e = 2$, $C = 853$, and $NX = 60$.

Suppose the government increases taxes to $T = 120$. Also, define the tax multiplier as the change in **equilibrium** income brought about by a unit increase in taxes, $\frac{\Delta Y}{\Delta T}$.

- c) Compute equilibrium income, exchange rate, consumption, and net exports under the assumption that the economy is at a flexible exchange rate regime. Compute the tax multiplier. (4 points)

Solution: From the LM* curve, $Y = 1124$. The new IS* curve is

$$Y = 1204 - 80e.$$

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So $e = 1$, $C = 853$, and $NX = 80$. The tax multiplier is equal to 1.

- d) Redo the previous question, now assuming that the economy is at a fixed exchange rate regime.
(4 points)

Solution: from the IS* curve, we get $Y = 1044$. From the LM* curve, we get $M = 894$. So $C = 793$ and $NX = 60$. The tax multiplier is -3.

Question 4 (15 points)

Consider an economy characterized by the following equations:

$$\begin{aligned}y &= k^{\frac{1}{2}}, \\i &= sy, \\ \Delta k &= i - (n + g + \delta)k,\end{aligned}$$

where y , c , i , and k are, respectively, output, consumption, investment, and capital **per effective worker**.

- a) Derive the steady-state level of capital as a function of s , n , δ , and g . (4 points)

Solution: the steady-state is

$$k = \left(\frac{s}{n + g + \delta} \right)^2$$

- b) At the steady-state, what is the growth rate of real output? (3 points)

Solution: It is equal to $n + g$.

In economy A, $s^A = 0.4$, $n^A = 0.01$, $g^A = 0.02$, and $\delta^A = 0.01$.

- c) Does this economy have the Golden Rule steady state level of capital? Why/why not? If not, what would need to happen to the saving rate in order to reach the Golden Rule? (4 points)

Solution: No, because the Golden Rule savings rate is 0.5. So the savings rate should increase.

In economy B, output is currently a third of economy A, and $n^B = 0.01$, $g^B = 0.05$.

- d) Assume both economies grow at their steady-state growth rate of output. Will real output in economy B ever catch up with real output in economy A? If so, how many years will it take? (if needed, round your answer to two decimal points) (4 points)

Solution: Yes, because its steady state growth rate is 0.06, which is higher than that of economy A. It will take 36.62 years.