Review Questions - CHAPTER 8

1. The formula for steady-state consumption per worker (c^*) as a function of output per worker and investment per worker is:
   A) $c^* = f(k^*) - \delta k^*$.
   B) $c^* = f(k^*) + \delta k^*$.
   C) $c^* = f(k^*) \div \delta k^*$.
   D) $c^* = k^* - \delta f(k)^*$.

2. When an economy begins above the Golden Rule, reaching the Golden Rule:
   A) produces lower consumption at all times in the future.
   B) produces higher consumption at all times in the future.
   C) requires initially reducing consumption to increase consumption in the future.
   D) requires initially increasing consumption to decrease consumption in the future.

3. Analysis of population growth around the world concludes that countries with high population growth tend to:
   A) have high income per worker.
   B) have a lower level of income per worker than other parts of the world.
   C) have the same standard of living as other parts of the world.
   D) tend to be the high-income-producing nations of the world.

4. If the per-worker production function is given by $y = k^{1/2}$, the saving ratio is 0.2, and the depreciation rate is 0.1, then the steady-state ratio of output per worker (y) is:
   A) 1.
   B) 2.
   C) 3.
   D) 4.

5. If a war destroys a large portion of a country's capital stock but the saving rate is unchanged, the Solow model predicts that output will grow and that the new steady state will approach:
   A) a higher level of output per person than before.
   B) the same level of output per person as before.
   C) a lower level of output per person than before.
   D) the Golden Rule level of output per person.

6. According to the Solow growth model, high population growth rates:
   A) force the capital stock to be spread thinly, thereby reducing living standards.
   B) place great strains on an economy's productive resources, resulting in perpetual poverty.
   C) are a prerequisite for technological advances and higher living standards.
   D) are not a factor in determining living standards.

7. An increase in the rate of population growth with no change in the saving rate:
   A) increases the steady-state level of capital per worker.
   B) decreases the steady-state level of capital per worker.
   C) does not affect the steady-state level of capital per worker.
   D) decreases the rate of output growth in the short run.

8. According to Kremer, large populations:
   A) require the capital stock to be spread thinly, thereby reducing living standards.
   B) place great strains on an economy's productive resources, resulting in perpetual poverty.
   C) are a prerequisite for technological advances and higher living standards.
   D) are not a factor in determining living standards.

9. When $f(k)$ is drawn on a graph with increases in k noted along the horizontal axis, the:
   A) graph is a straight line.
   B) slope of the line eventually gets flatter and flatter.
   C) slope of the line eventually becomes negative.
   D) slope of the line eventually becomes steeper and steeper.

10. When an economy begins below the Golden Rule, reaching the Golden Rule:
   A) produces lower consumption at all times in the future.
   B) produces higher consumption at all times in the future.
   C) requires initially reducing consumption to increase consumption in the future.
   D) requires initially increasing consumption to decrease consumption in the future.

11. In the Solow growth model, the assumption of constant returns to scale means that:
   A) all economies have the same amount of capital per worker.
   B) the steady-state level of output is constant regardless of the number of workers.
   C) the saving rate equals the constant rate of depreciation.
   D) the number of workers in an economy does not affect the relationship between output per worker and capital per worker.

12. In the Solow growth model, an economy in the steady state with a population growth rate of n but no technological growth will exhibit a growth rate of total output at rate:
    A) 0.
    B) n.
    C) δ.
    D) $(n + \delta)$.

13. If a larger share of national output is devoted to investment, then living standards will:
    A) always decline in the short run but rise in the long run.
    B) always rise in both the short and long runs.
    C) decline in the short run and may not rise in the long run.
    D) rise in the short run but may not rise in the long run.

14. If the per-worker production function is given by $y = k^{1/2}$, the saving ratio is 0.3, and the depreciation rate is 0.1, then the steady-state ratio of capital to labor is:
    A) 1.
    B) 2.
    C) 4.
    D) 9.

15. If $y = k^{1/2}$, the country saves 10 percent of its output each year, and the steady-state level of capital per worker is 4, then the steady-state levels of output per worker and consumption per worker are:
    A) 2 and 1.6, respectively.
    B) 2 and 1.8, respectively.
    C) 4 and 3.2, respectively.
    D) 4 and 3.6, respectively.

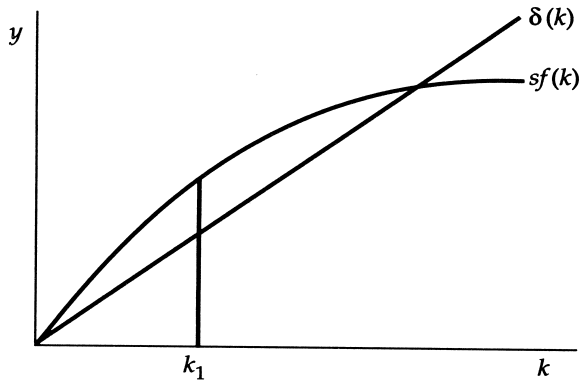
16. The steady-state level of capital occurs when the change in the capital stock (Δk) equals:
    A) 0.
    B) the saving rate.
    C) the depreciation rate.
    D) the population growth rate.

17. In the Solow growth model with population growth, but no technological change, a higher level of steady-state output per worker can be obtained by *all* of the following *except*:
    A) increasing the saving rate.
    B) decreasing the depreciation rate.
    C) increasing the population growth rate.
    D) increasing the capital per worker ratio.

18. In the Solow growth model, with a given production function, depreciation rate, saving rate, and no technological change, higher rates of population growth produce:
    A) higher steady-state ratios of capital per worker.
    B) higher steady-state growth rates of output per worker.
    C) higher steady-state growth rates of total output.
    D) higher steady-state levels of output per worker.

19. The consumption function in the Solow model assumes that society saves a:
    A) constant proportion of income.
    B) smaller proportion of income as it becomes richer.
    C) larger proportion of income as it becomes richer.
    D) larger proportion of income when the interest rate is higher.

20. Exhibit: The Capital–Labor Ratio



In this graph, starting from capital–labor ratio k_1, the capital–labor ratio will:
    A) decrease.
    B) remain constant.
    C) increase.
    D) first decrease and then remain constant.

21. Suppose an economy is initially in a steady state with capital per worker exceeding the Golden Rule level. If the saving rate falls to a rate consistent with the Golden Rule, then in the transition to the new steady state, consumption per worker will:
    A) always exceed the initial level.
    B) first fall below then rise above the initial level.
    C) first rise above then fall below the initial level.
    D) always be lower than the initial level.

22. In the Solow growth model with no population growth and no technological progress, the higher the steady capital-per-worker ratio, the higher the steady-state:
    A) growth rate of total output.
    B) level of consumption per worker.
    C) growth rate of output per worker.
    D) level of output per worker.

23. In the Solow growth model of Chapter 8, where s is the saving rate, y is output per worker, and i is investment per worker, consumption per worker (c) equals:
    A) sy
    B) $(1 - s)y$
    C) $(1 + s)y$
    D) $(1 - s)y - i$

24. 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.

25. If the per-worker production function is given by $y = k^{1/2}$, the saving ratio is 0.3, and the depreciation rate is 0.1, then the steady-state ratio of output per worker (y) is:
    A) 1.
    B) 2.
    C) 3.
    D) 4.

26. According to Malthus, large populations:
    A) require the capital stock to be spread thinly, thereby reducing living standards.
    B) place great strains on an economy's productive resources, resulting in perpetual poverty.
    C) are a prerequisite for technological advances and higher living standards.
    D) are not a factor in determining living standards.

27. Starting from a steady-state situation, if the saving rate increases, the rate of growth of capital per worker will:
    A) increase and continue to increase unabated.
    B) increase until the new steady state is reached.
    C) decrease until the new steady state is reached.
    D) decrease and continue to decrease unabated.

28. If the national saving rate increases, the:
    A) economy will grow at a faster rate forever.
    B) capital–labor ratio will increase forever.
    C) economy will grow at a faster rate until a new, higher, steady-state capital–labor ratio is reached.
    D) capital–labor ratio will eventually decline.

29. The Malthusian model that predicts mankind will remain in poverty forever:
    A) underestimated the possibility for technological progress.
    B) failed to predict that scarcity would be eliminated in the modern world.
    C) assumed that prosperity would lead to declining human fertility.
    D) recognized that the ability of natural resources to sustain humans is far greater than the power of population to consume resources.

30. The change in capital stock per worker (Δk) may be expressed as a function of s = the saving ratio, $f(k)$ = output per worker, k = capital per worker, and δ = the depreciation rate, by the equation:
    A) $\Delta k = sf(k)/\delta k$.
    B) $\Delta k = sf(k) \times \delta k$.
    C) $\Delta k = sf(k) + \delta k$.
    D) $\Delta k = sf(k) - \delta k$.

31. To determine whether an economy is operating at its Golden Rule level of capital stock, a policymaker must determine the steady-state saving rate that produces the:
    A) largest *MPK*.
    B) smallest depreciation rate.
    C) largest consumption per worker.
    D) largest output per worker.

32. Investment per worker (i) as a function of the saving ratio (s) and output per worker ($f(k)$) may be expressed as:
    A) $s + f(k)$.
    B) $s - f(k)$.
    C) $sf(k)$.
    D) $s/f(k)$.

33. In the Solow growth model of an economy with population growth but no technological change, the break-even level of investment must do *all* of the following *except*:
    A) offset the depreciation of existing capital.
    B) provide capital for new workers.
    C) equal the marginal productivity of capital (MPK).
    D) keep the level of capital per worker constant.

34. In the Solow growth model the saving rate determines the allocation of output between:
    A) saving and investment.
    B) output and capital.
    C) consumption and output.
    D) investment and consumption.

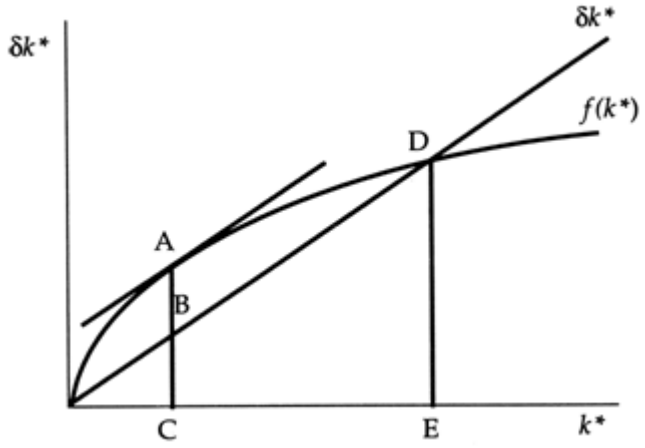
35. In the Solow growth model with population growth, but no technological progress, if in the steady state the marginal product of capital equals 0.10, the depreciation rate equals 0.05, and the rate of population growth equals 0.03, then the capital per worker ratio ____ the Golden Rule level.
    A) is above
    B) is below
    C) is equal to
    D) will move to

36. A reduction in the saving rate starting from a steady state with more capital than the Golden Rule causes investment to _____ in the transition to the new steady state.
    A) increase
    B) decrease
    C) first increase, then decrease
    D) first decrease, then increase

37. If a larger share of national output is devoted to investment, starting from an initial steady-state capital stock below the Golden Rule level, then productivity growth will:
    A) increase in the short run but not in the long run.
    B) increase in the long run but not in the short run.
    C) increase in both the short run and the long run.
    D) not increase in either the short run or the long run.

Use the following to answer question 38:

Exhibit: Steady-State Consumption II



38. (Exhibit: Steady-State Consumption II) The Golden Rule level of steady-state investment per worker is:
    A) AC.
    B) AB.
    C) BC.
    D) DE.

39. The formula for the steady-state ratio of capital to labor (k^*) with population growth at rate n but no technological change, where s is the saving rate, is s:
    A) divided by the sum of the depreciation rate plus n.
    B) multiplied by the sum of the depreciation rate plus n.
    C) divided by the product of $f(k^*)$ and the sum of the depreciation rate plus n.
    D) multiplied by $f(k^*)$ divided by the sum of the depreciation rate plus n.

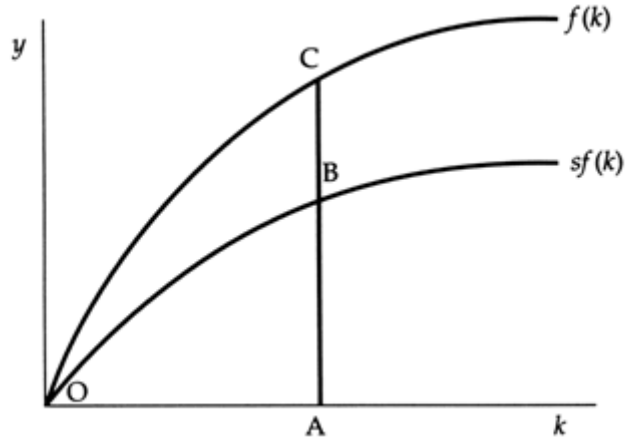
40. If an economy with no population growth or technological change has a steady-state *MPK* of 0.1, a depreciation rate of 0.1, and a saving rate of 0.2, then the steady-state capital stock:
    A) is greater than the Golden Rule level.
    B) is less than the Golden Rule level.
    C) equals the Golden Rule level.
    D) could be either above or below the Golden Rule level.

41. In the Solow growth model, an economy in the steady state with a population growth rate of n but no technological growth will exhibit a growth rate of output per worker at rate:
    A) 0.
    B) n.
    C) δ.
    D) $(n + \delta)$.

42. In the Solow model, it is assumed that a(n) _____ fraction of capital wears out as the capital–labor ratio increases.
    A) smaller
    B) larger
    C) constant
    D) increasing

43. If an economy moves from a steady state with positive population growth to a zero population growth rate, then in the new steady state, total output growth will be _____ and growth of output per person will be _____.
    A) lower; lower
    B) lower; the same as it was before
    C) higher; higher than it was before
    D) higher; lower

44. Exhibit: Output, Consumption, and Investment



In this graph, when the capital–labor ratio is OA, AB represents:
A) investment per worker, and AC represents consumption per worker.
B) consumption per worker, and AC represents investment per worker.
C) investment per worker, and BC represents consumption per worker.
D) consumption per worker, and BC represents investment per worker.

45. In the Solow growth model with population growth, but no technological progress, in the Golden Rule steady state, the marginal product of capital minus the rate of depreciation will equal:
A) 0.
B) the population growth rate.
C) the saving rate.
D) output per worker.

46. 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) $Y/L = (K/L)^{0.7}$.

47. In the Solow growth model, if investment exceeds depreciation, the capital stock will _____ and output will _____ until the steady state is attained.
A) increase; increase
B) increase; decrease
C) decrease; decrease
D) decrease; increase

48. With a per-worker production function $y = k^{1/2}$, the steady-state capital stock per worker (k^*) as a function of the saving rate (s) is given by:
    A) $k^* = (s/\delta)^2$.
    B) $k^* = (\delta/s)^2$.
    C) $k^* = s/\delta$.
    D) $k^* = \delta/s$.

49. If an economy with no population growth or technological change has a steady-state *MPK* of 0.125, a depreciation rate of 0.1, and a saving rate of 0.225, then the steady-state capital stock:
    A) is greater than the Golden Rule level.
    B) is less than the Golden Rule level.
    C) equals the Golden Rule level.
    D) could be either above or below the Golden Rule level.

50. _____ cause(s) the capital stock to rise, while _____ cause(s) the capital stock to fall.
    A) Inflation; deflation
    B) Interest rates; the discount rate
    C) Investment; depreciation
    D) International trade; depressions

51. An increase in the saving rate starting from a steady state with less capital than the Golden Rule causes investment to _____ in the transition to the new steady state.
    A) increase
    B) decrease
    C) first increase, then decrease
    D) first decrease, then increase

52. If the U.S. production function is Cobb–Douglas with capital share 0.3, output growth is 3 percent per year, depreciation is 4 percent per year, and the Golden Rule steady-state capital–output ratio is 4.29, to reach the Golden Rule steady state, the saving rate must be:
    A) 17.5 percent.
    B) 25 percent.
    C) 30 percent.
    D) 42.9 percent.

53. In the Solow growth model with population growth but no technological progress, increases in capital have a positive impact on steady-state consumption per worker by _____, but have a negative impact on steady-state consumption per worker by _____.
    A) increasing the capital to worker ratio; reducing saving in the steady state.
    B) reducing investment required in the steady state; increasing saving in the steady state.
    C) increasing output; increasing output required to replace depreciating capital.
    D) decreasing the saving rate; increasing the depreciation rate.

54. If an economy is in a steady state with no population growth or technological change and the marginal product of capital is less than the depreciation rate:
    A) the economy is following the Golden Rule.
    B) steady-state consumption per worker would be higher in a steady state with a lower saving rate.
    C) steady-state consumption per worker would be higher in a steady state with a higher saving rate.
    D) the depreciation rate should be decreased to achieve the Golden Rule level of consumption per worker.

55. In the Solow growth model of Chapter 8, the economy ends up with a steady-state level of capital:
    A) only if it starts from a level of capital below the steady-state level.
    B) only if it starts from a level of capital above the steady-state level.
    C) only if it starts from a steady-state level of capital.
    D) regardless of the starting level of capital.

56. In the Solow growth model of Chapter 8, for any given capital stock, the _____ determines how much output the economy produces and the _____ determines the allocation of output between consumption and investment.
    A) saving rate; production function
    B) depreciation rate; population growth rate
    C) production function; saving rate
    D) population growth rate; saving rate

57. In the Solow growth model, with a given production function, depreciation rate, saving rate, and no technological change, lower rates of population growth produce:
    A) lower steady-state ratios of capital per worker.
    B) lower steady-state growth rates of output per worker.
    C) lower steady-state growth rates of total output.
    D) lower steady-state levels of output per worker.

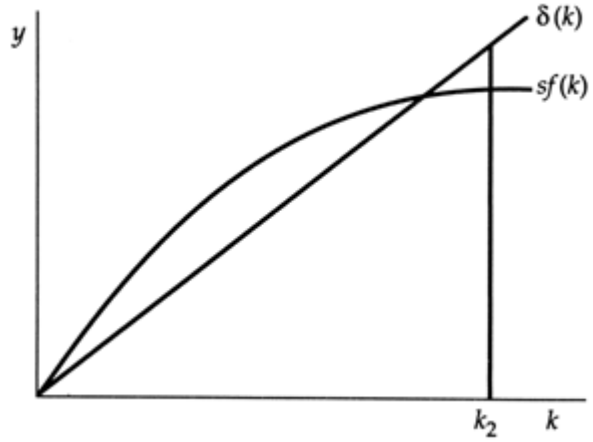
58. When $f(k)$ is drawn on a graph with increases in k noted along the horizontal axis, the slope of the line denotes:
    A) output per worker.
    B) output per unit of capital.
    C) the marginal product of labor.
    D) the marginal product of capital.

59. In the Solow growth model, with a given production function, depreciation rate, no technological change, and no population growth, a higher saving rate produces a:
    A) higher *MPK* in the new steady state.
    B) higher steady-state growth rate of output per worker.
    C) higher steady-state growth rate of total output.
    D) higher steady-state level of output per worker.

60. Assume that a war reduces a country's labor force but does not directly affect its capital stock. Then the immediate impact will be that:
    A) total output will fall, but output per worker will rise.
    B) total output will rise, but output per worker will fall.
    C) both total output and output per worker will fall.
    D) both total output and output per worker will rise.

61. In the Solow growth model, increases in capital _____ output and _____ the amount of output used to replace depreciating capital.
    A) increase; increase
    B) increase; decrease
    C) decrease; increase
    D) decrease; decrease

62. Exhibit: Capital–Labor Ratio and the Steady State



In this graph, capital–labor ratio k_2 is not the steady-state capital–labor ratio because:
A) the saving rate is too high.
B) the investment ratio is too high.
C) gross investment is greater than depreciation.
D) depreciation is greater than gross investment.

63. With population growth at rate n but no technological change, the Golden Rule steady state may be achieved by equating the marginal product of capital (*MPK*):
A) net of depreciation to n.
B) to n.
C) net of depreciation to the depreciation rate plus n.
D) to the depreciation rate.

64. The production function $y = f(k)$ means:
A) labor is not a factor of production.
B) output per worker is a function of labor productivity.
C) output per worker is a function of capital per worker.
D) the production function exhibits increasing returns to scale.

65. If the capital stock equals 200 units in year 1 and the depreciation rate is 5 percent per year, then in year 2, assuming no new or replacement investment, the capital stock would equal _____ units.
A) 210
B) 200
C) 195
D) 190

66. In the Solow growth model, if two countries are otherwise identical (with the same production function, same saving rate, same depreciation rate, and same rate of population growth) except that Country Large has a population of 1 billion workers and Country Small has a population of 10 million workers, then the steady-state level of output per worker will be _____ and the steady-state growth rate of output per worker will be _____.
    A) the same in both countries; the same in both countries
    B) higher in Country Large; higher in Country Large
    C) higher in Country Small; higher in Country Small
    D) higher in Country Large; higher in Country Small

67. If an economy is in a steady state with no population growth or technological change and the capital stock is below the Golden Rule:
    A) a policymaker should definitely take all possible steps to increase the saving rate.
    B) if the saving rate is increased, output and consumption per capita will both rise, both in the short and long runs.
    C) if the saving rate is increased, output per capita will at first decline and then rise above its initial level, and consumption per capita will rise both in the short and long runs.
    D) if the saving rate is increased, output per capita will rise and consumption per capita will first decline and then rise above its initial level.

68. If an economy is in a steady state with no population growth or technological change and the capital stock is above the Golden Rule level and the saving rate falls:
    A) output, consumption, investment, and depreciation will all decrease.
    B) output and investment will decrease, and consumption and depreciation will increase.
    C) output and investment will decrease, and consumption and depreciation will increase and then decrease but finally approach levels above their initial state.
    D) output, investment, and depreciation will decrease, and consumption will increase and then decrease but finally approach a level above its initial state.

69. The Golden Rule level of capital accumulation is the steady state with the highest level of:
    A) output per worker.
    B) capital per worker.
    C) savings per worker.
    D) consumption per worker.

70. Two economies are identical except that the level of capital per worker is higher in Highland than in Lowland. The production functions in both economies exhibit diminishing marginal product of capital. An extra unit of capital per worker increases output per worker:
    A) more in Highland.
    B) more in Lowland.
    C) by the same amount in Highland and Lowland.
    D) in Highland, but not in Lowland.

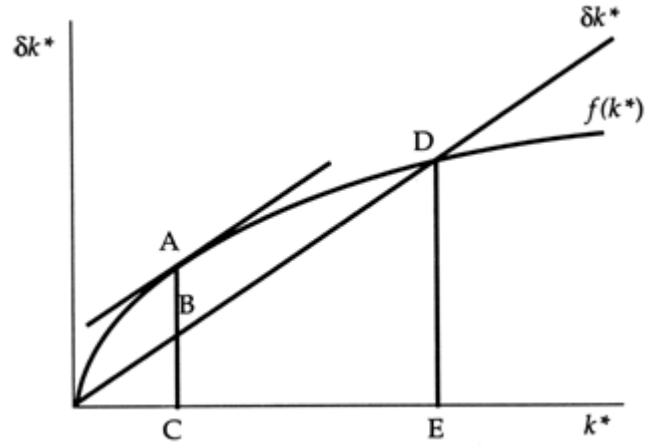
71. According to the Kremerian model, large populations improve living standards because:
    A) crowded conditions put more pressure on people to work hard.
    B) there are more people who can make discoveries and contribute to innovation.
    C) more people have the opportunity for leisure and recreation.
    D) most people prefer to live with many other people.

72. A higher saving rate leads to a:
    A) higher rate of economic growth in both the short run and the long run.
    B) higher rate of economic growth only in the long run.
    C) higher rate of economic growth in the short run but a decline in the long run.
    D) larger capital stock and a higher level of output in the long run.

73. If the production function exhibits decreasing returns to scale in the steady state, an increase in the rate of population would lead to:
    A) growth in total output and growth in output per worker.
    B) growth in total output but no growth in output per worker.
    C) growth in total output but a decrease in output per worker.
    D) no growth in total output or in output per worker.

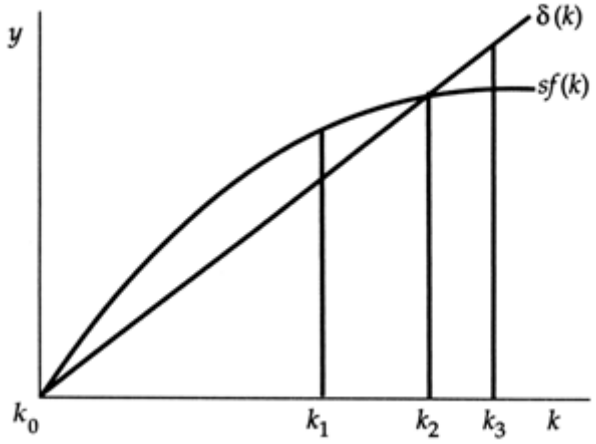
Use the following to answer question 74:

Exhibit: Steady-State Consumption II



74. (Exhibit: Steady-State Consumption II) The Golden Rule level of steady-state consumption per worker is:
    A) AC.
    B) AB.
    C) BC.
    D) DE.

75. Exhibit: Steady-State Capital–Labor Ratio



In this graph, the capital–labor ratio that represents the steady-state capital–ratio is:
    A) k_0.
    B) k_1.
    C) k_2.
    D) k_3.

Answer Key

1. A
2. B
3. B
4. B
5. B
6. A
7. B
8. C
9. B
10. C
11. D
12. B
13. C
14. D
15. B
16. A
17. C
18. C
19. A
20. C
21. A
22. D
23. B
24. B
25. C
26. B
27. B
28. C
29. A
30. D
31. C
32. C
33. C
34. D
35. B
36. B
37. A
38. C
39. D
40. C
41. A
42. C
43. B
44. C

45. B
46. B
47. A
48. A
49. B
50. C
51. A
52. C
53. C
54. B
55. D
56. C
57. C
58. D
59. D
60. A
61. A
62. D
63. A
64. C
65. D
66. A
67. D
68. D
69. D
70. B
71. B
72. D
73. C
74. B
75. C