1) If an economy with constant returns to scale were to double its physical capital stock, its available natural resources, and its human capital, but leave the size of the labor force the same,

a. its output would stay the same and so would its productivity.

b. its output and productivity would increase, but less than double.

c. its output and productivity would increase by more than double.

d. None of the above is correct.

2) Suppose that real GDP grew more in Country A than in Country B last year.

a. Country A must have a higher standard of living than country B.

b. Country A's productivity must have grown faster than country B's.

c. Both of the above are correct.

d. None of the above is correct.

3) Real Foods produced 400,000 cans of diced tomatoes in 2007 and 460,000 cans of diced tomatoes in 2008. They employed the same number of labor hours each year. Relative to their productivity in 2007, their productivity in 2008 was

a. 6 percent lower.

b. unchanged.

c. 6 percent higher.

d. 15 percent higher.

4) Suppose a country imposes new restrictions on how many hours people can work. If these restrictions reduce the total number of hours worked in the economy, but all other factors that determine output are held fixed, then

a. productivity and output both rise.

b. productivity rises and output falls.

c. productivity falls and output rises.

d. productivity and output fall.

5) Suppose that there are diminishing returns to capital. Suppose also that two countries are the same except one has more capital per worker and so it has more real GDP per worker than the other. Finally, suppose that the saving rate in both countries increases from 4 percent to 7 percent. Over the next ten years we would expect that
6) Suppose the market for loanable funds is in equilibrium. Given the numbers below, determine the quantity of loanable funds demanded.

<table>
<thead>
<tr>
<th>GDP</th>
<th>$100 billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumption</td>
<td>$65 billion</td>
</tr>
<tr>
<td>Taxes Net of Transfers</td>
<td>$15 billion</td>
</tr>
<tr>
<td>Government Spending</td>
<td>$20 billion</td>
</tr>
</tbody>
</table>

a. $25 billion  
b. $20 billion  
c. $15 billion  
d. $10 billion

7) If there is a shortage of loanable funds, then
a. the quantity demanded is greater than the quantity supplied and the interest rate will rise.  
b. the quantity demanded is greater than the quantity supplied and the interest rate will fall.  
c. the quantity supplied is greater than the quantity demanded and the interest rate will rise.  
d. the quantity supplied is greater than the quantity demanded and the interest rate will fall.

8) People who buy newly issued stock in a corporation such as Crate and Barrel provide
a. debt finance and so become part owners of Crate and Barrel.  
b. debt finance and so become creditors of Crate and Barrel.  
c. equity finance and so become part owners of Crate and Barrel.  
d. equity finance and so become creditors of Crate and Barrel.

9) For a closed economy, GDP is $11 trillion, consumption is $7 trillion, taxes are $3 trillion and the government runs a surplus of $1 trillion. What are private saving and national saving?

a. $4 trillion and $1 trillion, respectively  
b. $4 trillion and $5 trillion, respectively  
c. $1 trillion and $2 trillion, respectively  
d. $1 trillion and $1 trillion, respectively

10) Bolivia had a smaller budget deficit in 2003 than in 2002. Other things the same, we would expect this reduction in the budget deficit to have

a. increased both interest rates and investment.  
b. increased interest rates and decreased investment.  
c. decreased interest rates and increased investment.  
d. decreased both interest rates and investment.

11) Marcia has four savings accounts. Which account has the largest balance?

a. $100 deposited 1 year ago at an 8 percent interest rate  
b. $100 deposited 2 years ago at a 4 percent interest rate  
c. $100 deposited 4 years ago at a 2 percent interest rate  
d. $100 deposited 8 years ago at a 1 percent interest rate
12) Alice says that the present value of $700 to be received one year from today if the interest rate is 6 percent is less than the present value of $700 to be received two years from today if the interest rate is 3 percent. Beth says that $700 saved for one year at 6 percent interest has a smaller future value than $700 saved for two years at 3 percent interest.

a. Both Alice and Beth are correct.
b. Both Alice and Beth are incorrect.
c. Only Alice is correct.
d. Only Beth is correct.

13) Suppose you win a small lottery and you are given the following choice: You can (1) receive an immediate payment of $10,000 or (2) three annual payments, each in the amount of $3,600, with the first payment coming one year from now, the second two years from now, and the third three years from now. You would choose to take the three annual payments if the interest rate is

a. 2 percent, but not if the interest rate is 3 percent.
b. 3 percent, but not if the interest rate is 4 percent.
c. 4 percent, but not if the interest rate is 5 percent.
d. 5 percent, but not if the interest rate is 6 percent.

14) Financial intermediaries typically require mortgage borrowers to have homeowner's insurance and do credit checks before making the loan.

a. The insurance requirement and the credit check are both designed primarily to reduce adverse selection.
b. The insurance requirement and the credit check are both designed primarily to reduce the risk of moral hazard.
c. The insurance requirement is designed primarily to reduce adverse selection; the credit check is designed primarily to reduce the risk of moral hazard.
d. The insurance requirement is designed primarily to reduce the risk of moral hazard; the credit check is designed primarily to reduce adverse selection.

15) The efficient markets hypothesis says that

a. only individual investors can make money in the stock market.
b. it should be difficult to find stocks whose price differs from their fundamental value.
c. stock prices do not follow a random walk.
d. All of the above are correct.

16) Consider the following production function:

\[ Y = \frac{2KL}{K + L} \]

Is it Constant Return to Scale?

a. Yes, always
b. No, it is increasing return to scale
c. No, it is decreasing return to scale
d. Both a and b are correct.

Step 1: multiply each factor of production by a constant, say x which is different from 0 or 1,

\[ \frac{2(xKL)(xL)}{xK + xL} \]

Step 2: manipulate mathematically the above expression so that you can factor out x somehow.

\[ \frac{2(xKL)(xL)}{xK + xL} = \frac{2x^2KL}{x(K + L)} = \frac{2xKL}{K + L} = x \frac{2KL}{K + L} \]
YOUR NAME: ______________________________________

YOUR R.I.’s NAME: ______________________________________

Step 3: use the production function (i.e. the definition of $Y$) to find the answer. We want to check whether after multiplying each factor of production by $x$, $Y$ is multiplied by the same amount $x$ too or not.

In our specific case $Y = \frac{2KL}{K + L}$ so we obtained that multiplying each factor of production by $x$ yields

(from step 2): $x \frac{2KL}{K + L}$ this expression is equal to $x Y$ always.

17) Brad says that the present value of $800$ one year from today if the interest rate is $7$ percent is more than the present value of $800$ two years from today if the interest rate is $4$ percent. George says that $800$ saved for one year at $7$ percent interest has a greater future value than $800$ saved for two years at $4$ percent interest.
   a. Both Brad and George are correct.
   b. Both Brad and George are incorrect.
   c. Only George is correct.
   d. Only Brad is correct.

Brad statement implies: Present value of $800$ one year from today if the interest rate is $7$ percent is $800 / (1 + 0.07)^1 = 747.6$. Present value of $800$ two years from today if the interest rate is $4$ percent is $800 / (1 + 0.04)^2 = 739.6$. Thus his statement is true.

George statement implies: Future value of $800$ saved for one year at $7$ percent interest is $800 (1 + 0.07)^1 = 856$. Future value of $800$ saved for two years at $4$ percent interest is $800 (1 + 0.04)^2 = 865.28$. Thus his statement is false.

18) You have some estimates of national accounts numbers for a closed economy for the coming year. Under one set of expectations, government purchases will be $30$ billion, transfer payments will be $10$ billion, and taxes will be $45$ billion. Under another set of expectations, GDP will be $200$ billion, taxes will be $50$ billion, transfer payments will be $20$ billion, consumption will be $120$ million, and investment will be $40$ billion. Based on these numbers in the first case there should be a
   a. $15$ billion surplus, and in the second case a $10$ billion surplus.
   b. $15$ billion surplus, and in the second case a $10$ billion deficit.
   c. $5$ billion surplus, and in the second case a $10$ billion surplus.
   d. $5$ billion surplus, and in the second case a $10$ billion deficit.

19) A risk-averse person has
   a. utility and marginal utility curves that slope upward.
   b. utility and marginal utility curves that slope downward.
   c. a utility curve that slopes down and a marginal utility curve that slopes upward.
   d. a utility curve that slopes upward and a marginal utility curve that slopes downward.

20) (2 POINTS) According to the assigned reading I gave you: “Implications and empirical facts of the Solow model”
   a. Two countries with the same saving rate ($s$), the country with lower initial aggregate capital stock grows faster.
   b. Two countries with the same initial aggregate capital stock ($K$), the country with higher saving rate grows slower.
   c. Countries with lower saving rate ($s$) enjoy higher GDP per capita in the long run.
EXERCISE I
Consider the loanable funds’ market in the country of Lakers land. The supply of loanable fund is characterized by the following equation:

\[ Q_s = 30r \]

And the demand of loanable fund is characterized by

\[ Q_d = 400 - 10r \]

The interest rate \( r \) is in percentage. For example, \( r = 3 \) means that interest rate is 3%.

a) (5 points) Compute the equilibrium quantity of loans and equilibrium interest rate in the country of Lakers land.

Set demand equals to supply
We have \( 30r = 400 - 10r \), so \( 40r = 400 \).
Therefore \( r = 10 \) and \( Q = 300 \).

b) (7 points) Compute the total welfare in this case.

Basically we compute the area of the triangle between demand and supply. From the demand curve we know the base of the triangle is 40. The height of the triangle is 300 because it is the equilibrium level of \( Q \).
Therefore total welfare is \( 0.5 \times 40 \times 300 = 6000 \)

c) (8 points) Kobe, the king of Lakers land, is concerned with the high interest rate that you computed in part a), and he decides to put an upper bound on the interest rate (i.e. a price ceiling). The upper bound on the interest rate is set to be 5 percent so we have \( r = 5 \). Compute the quantity of loanable fund supplied, quantity of loanable fund demanded, and total welfare in this case.

When \( r = 5 \): Quantity supplied = \( 30 \times 5 = 150 \) and Quantity demanded = \( 400 - 10 \times 5 = 350 \)

We have a situation of excess demand. The equilibrium level of loanable funds is 150 because the supply cannot exceed that.

The welfare in this case is a trapezoid (see figure below the trapezoid whose line are shaded in red). The longer base of trapezoid is 40 (the intercept of the demand curve). Given that the equilibrium value of loanable funds is set by the quantity supplied at \( r = 5 \rightarrow Q = 150 \), the interest rate on the demand curve at this quantity is \( 150 = 400 - 10r \), and \( r = 25 \). Therefore the shorter base of trapezoid is the distance between the interest rate when the demand is evaluated at \( Q = 150 \).
and the actual equilibrium level of the interest rate: 25-5 = 20. The height of the trapezoid is 150. The total welfare is (20+40)*0.5*150 = 4500.

EXERCISE II
Consider the Solow model we have seen and studied in class.
You know that the production function is given by \( Y_t = AK_t^{0.8}L_t^{0.2} \)
You also know that the depreciation of capital is \( d = 2\% \), the population growth rate is \( n = 3\% \), and the saving rate is \( s = 5\% \)
Population in year 1 is \( L_1 = 5 \)
Capital in year 1 is \( K_1 = 4 \)
a) (5 points) Write down the 5 basic equations that characterize the Solow model.
a) The five equations are
\[
1) Y_t = AK_t^{0.8}L_t^{0.2} \\
2) S_t = sY_t \\
3) I_t = S_t \\
4) K_{t+1} = I_t + (1 - d)K_t \\
5) L_{t+1} = (1 + n)L_t \\
\]
b) (5 points) What is the value that A needs to be in order for the growth rate of aggregate physical capital between year 2 and year 1 to be 10%? Use two decimal places for your calculations if needed.
The equation for aggregate physical capital is
\[
K_{t+1} = I_t + (1 - d)K_t = sY_t + (1 - d)K_t \\
\]
To compute \( K_2 \) we need to compute \( Y_2 \) first, and \( Y_2 \) will depend on A
\[
Y_1 = A \times K_1^{0.8}L_1^{0.2} = 4.18 \times A \\
\]
Now, with this information, we can compute \( K_2 \) as a function of A.
\[
K_2 = sY_1 + (1 - d)K_1 = 0.05 \times 4.18 \times A + 0.98 \times 4 = 0.21 \times A + 3.92 \\
\]
We want the growth rate of physical capital between year 2 and year 1 to be 10% hence:

\[
100 \times \frac{K_2 - K_1}{K_1} = 10
\]

This is:

\[
100 \times \frac{0.21 \times A + 3.92 - 4}{4} = 10
\]

\[
21 \times A - 8 = 40
\]

\[
A = 2.29
\]  

c) (5 points) Assume now \( A = 2 \), and all the remaining parameters in our Solow model are exactly the same as given above. What is the steady state level of physical capital per capita? Use two decimal places for your calculations if needed.

The fundamental equation of the Solow Model is given by:

\[
k_{t+1} = \frac{sA(k_t)^α + (1 - d)k_t}{(1 + n)}
\]

Substituting the parameters we are given in it we get:

\[
k_{t+1} - k_t = 0.05 \times 2(k_t)^{0.8} - 0.03k_{t+1} - 0.02k_t
\]

We know that in steady state:

\[
k_{t+1} = k_t = \bar{k}
\]

Hence it must be that:

\[
0 = 0.1(\bar{k})^{0.8} - (0.05)\bar{k}
\]

Solving for \( \bar{k} \):

\[
0.1(\bar{k})^{0.8} = (0.05)\bar{k}
\]

\[
(\bar{k})^{0.8} = \frac{0.05}{0.1} \bar{k}
\]

\[
(\bar{k})^{-0.2} = 0.05
\]

\[
\bar{k} = \left( \frac{0.05}{0.1} \right)^{\frac{1}{0.2}} = 32
\]

This is the level of physical capital per capita in the steady state of the economy. At this level the physical capital per capita will stop growing.

d) (5 points) Assume again \( A = 2 \), and all the remaining parameters in our Solow model are exactly the same as given above except for the population growth rate. The population growth rate, \( n \), is now unknown (you need to find it in this part of the exercise). What should be the growth rate of the population if you want the growth rate of output between year 2 and year 1 to be 10%? Use two decimal places for your calculations if needed.

When \( A = 2 \) aggregate capital in the second year is:

\[
K_2 = 0.21 \times 2 + 3.92 = 4.34
\]

Output in year 1 is:

\[
Y_1 = A \times K_1^{0.8}L_1^{0.2} = 4.18 \times A = 8.36
\]

Population in year 2 is:
Output in year 2 is then:

\[ Y_2 = 2K_2^{0.8}L_2^{0.2} = 2 \times (4.34)^{0.8} \left((1 + n) \times 5\right)^{0.2} = 8.93(1 + n)^{0.2} \]

The growth rate of output is then:

\[ 100 \times \frac{Y_2 - Y_1}{Y_1} = 10 \]

And we need to solve for \( n \) the following expression:

\[ 100 \times \frac{8.93(1 + n)^{0.2} - 8.36}{8.36} = 10 \]

\[ 893(1 + n)^{0.2} - 836 = 83.6 \]

\[ (1 + n)^{0.2} = 1.03 \]

\[ n = 0.16 \]