ECON 3010 Intermediate Macroeconomics
Solutions to Exam #1

Multiple Choice Questions. (25 points; 2.5 pts each)

1. The total income of everyone in the economy is exactly equal to the total:

    A) expenditure on the economy's output of goods and services.
    B) consumption expenditures of everyone in the economy.
    C) expenditures of all businesses in the economy.
    D) government expenditures.

2. To compute the value of GDP:

    A) goods and services are valued at market prices.
    B) the sale of used goods is included.
    C) production for inventory is not included.
    D) goods and services are valued by weight.

3. 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, the value included in GDP should be:

    A) $0.50.
    B) $1.
    C) $2.
    D) $3.

4. An example of an imputed value in the GDP is the:

    A) value-added of meals cooked at home.
    B) housing services enjoyed by homeowners.
    C) services of automobiles to their owners.
    D) value of illegal drugs sold.

5. If GDP (measured in billions of current dollars) is $5,465, consumption is $3,657, investment is $741, and government purchases are $1,098, then net exports are:

    A) $131.
    B) –$131.
    C) $31.
    D) –$31.

6. In the national income accounts, government purchases are goods and services purchased by:

   A) the federal government.
   B) the federal and state governments.
   C) the state and local governments.
   D) the federal, state, and local governments.

7. A competitive, profit-maximizing firm hires labor until the:

   A) marginal product of labor equals the nominal wage.
   B) price of output multiplied by the marginal product of labor equals the nominal wage.
   C) real wage equals the real rental price of capital.
   D) nominal wage equals the rental price of capital.

8. If output is described by the production function $Y = AK^{0.2}L^{0.7}$, then the production function has:

   A) constant returns to scale.
   B) diminishing returns to scale.
   C) increasing returns to scale.
   D) a degree of returns to scale that cannot be determined from the information given.

9. The *real* interest rate is the:

   A) rate of interest actually paid by consumers.
   B) rate of interest actually paid by banks.
   C) rate of inflation minus the nominal interest rate.
   D) nominal interest rate minus the rate of inflation.

10. In the classical model with fixed income, if the demand for goods and services is less than the supply, the interest rate will:

   A) increase.
   B) decrease.
   C) remain unchanged.
   D) either increase or decrease, depending on whether consumption is greater or less than investment.

Problem Solving / Essay Questions. (75 points)

#11. (30 pts) Consider a macroeconomy that produces three goods: X, Y, and Z. Use the information below to answer the following questions.

Product	Quantity (in millions)		Price (in $)	
	2019	2020	2019	2020
X	10	15	$400	$300
Y	20	15	$2,000	$2,500
Z	100	120	$100	$150

(a) (10 pts) Calculate nominal and real GDP for 2019 and 2020 using 2019 as the base year. What are the growth rates of nominal and real GDP over this period? Explain why the growth rates have different signs.

$$Nominal\ GDP_{2019} = (10 \times \$400) + (20 \times \$2,000) + (100 \times \$100)$$
$$= \$4,000 + \$40,000 + \$10,000 = \$54,000$$
$$Nominal\ GDP_{2020} = (15 \times \$300) + (15 \times \$2,500) + (120 \times \$150)$$
$$= \$4,500 + \$37,500 + \$18,000 = \$60,000$$
$$Real\ GDP_{2019} = Nominal\ GDP_{2019} = \$54,000$$
$$Real\ GDP_{2020} = (15 \times \$400) + (15 \times \$2,000) + (120 \times \$100)$$
$$= \$6,000 + \$30,000 + \$12,000 = \$48,000$$

$$Nominal\ GDP\ growth\ rate = 100 \times \left(\frac{\$60,000 - \$54,000}{\$54,00}\right) = 11.1\%$$

$$Real\ GDP\ growth\ rate = 100 \times \left(\frac{\$48,000 - \$54,000}{\$54,000}\right) = -11.1\%$$

The nominal growth rate is positive because of inflation. Two of the three goods experienced price increases. The real GDP growth rate is negative because, holding prices constant, the quantity produced of the most expensive good (i.e., good Y) went down by 25%. This good receives the largest weight in the calculation for real GDP because it is by far the most expensive.

	Quantity (in millions)		Price (in $)	
Product	2019	2020	2019	2020
X	10	15	$400	$300
Y	20	15	$2,000	$2,500
Z	100	120	$100	$150

(b) (10 pts) Assume that basket of goods for the typical consumer includes 5 X's, 1 Y and 20 Z's. Calculate the GDP deflator and CPI for 2019 and 2020 using 2019 as the base year. Calculate the inflation rate between 2019 and 2020 using both the CPI and the GDP deflator.

$$GDP\ Deflator_{2019} = 100$$

$$GDP\ Deflator_{2020} = \frac{Nominal\ GDP_{2020}}{Real\ GDP_{2020}} \times 100 = \frac{\$60,000}{\$48,000} \times 100 = 125$$

$$CPI_{2019} = 100$$

$$CPI_{2020} = \frac{(5 \times \$300) + (1 \times \$2,500) + (20 \times \$150)}{(5 \times \$400) + (1 \times \$2,000) + (20 \times \$100)} \times 100 = \frac{\$7,000}{\$6,000} \times 100 \cong 116.7$$

(c) (10 pts) Now assume that Good Z, which was produced at home in 2019 and 2020, due to a new trade agreement is now imported from a foreign country. Describe in words (no need to re-calculate any numbers) how this will impact the calculation of nominal GDP, the CPI, and the GDP deflator.

Nominal GDP will fall because production of Good Z will no longer count in GDP. Since the GDP deflator is calculated using nominal and real GDP, the GDP deflator calculations will no longer include Good Z either. It is difficult to guess whether this will increase or decrease the deflator without knowing future quantities and prices, but the deflator will not include Good Z. There will be no change in the CPI assuming consumers continue to consume Good Z at the same rate and price remains unchanged.

#12. (30 pts) Consider the following Neoclassical model of the economy, where r is in percentage terms. Show all your work.

Supply	Demand
$Y = F(K, L) = 10\sqrt{KL}$	$C = 260 + 0.8(Y - T)$
$MPK = 5\sqrt{L/K};$	$I = 230 - 5r$
$MPL = ?$	$NX = 0$
$K = 400; L = 100$	$G = 100, T = 200$

(a) (10 pts) What is the level of GDP in the economy? How much of national income goes to workers and how much goes to the owners of capital? Show your work. How much are households saving? How much is the government saving?

The level of real GDP is $Y = 10\sqrt{KL} = 10\sqrt{400 \times 100} = 2000$.

The real wage is $\dfrac{W}{P} = MPL = 5\sqrt{K/L} = 5\sqrt{400/100} = 10$.

The amount of GDP going to workers is $\dfrac{W}{P} \times L = 10 \times 100 = 1000$.

The real rental rate is $\dfrac{R}{P} = MPK = 5\sqrt{L/K} = 5\sqrt{100/400} = 2.5$.

The amount of GDP going to the owners of capital is $\dfrac{R}{P} \times K = 2.5 \times 400 = 1000$.

Households are saving: $Y - T - C = 2000 - 200 - 1700 = 100$.

The government is saving: $T - G = 100$.

Supply	Demand
$Y = F(K, L) = 10\sqrt{KL}$	$C = 260 + 0.8(Y - T)$
$MPK = 5\sqrt{L/K};$	$I = 230 - 5r$
$MPL = ?$	$NX = 0$
$K = 400; L = 100$	$G = 100, T = 200$

(b) (10 pts) Find the interest rate that produces equilibrium in either the goods market or the loanable funds market. Draw two demand-supply diagrams (side-by-side) to show the equilibrium in the economy, making sure to carefully label and title both diagrams.
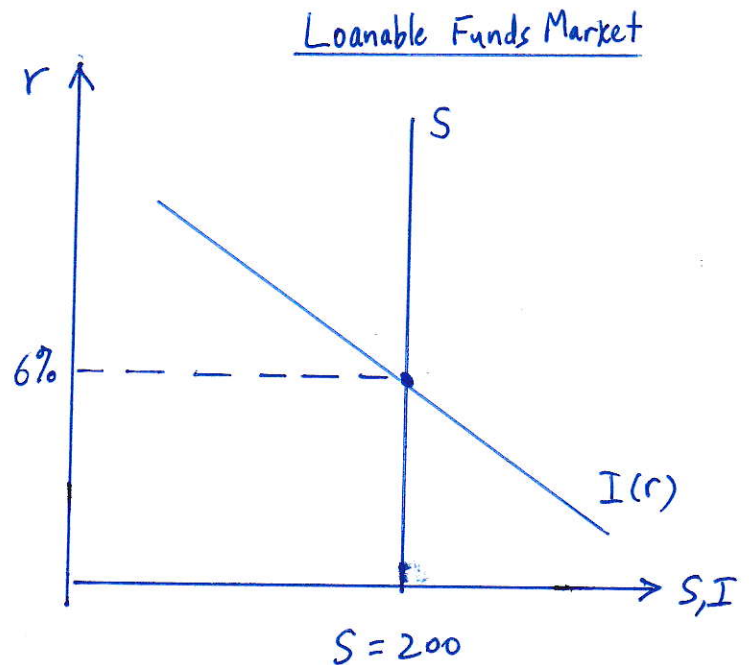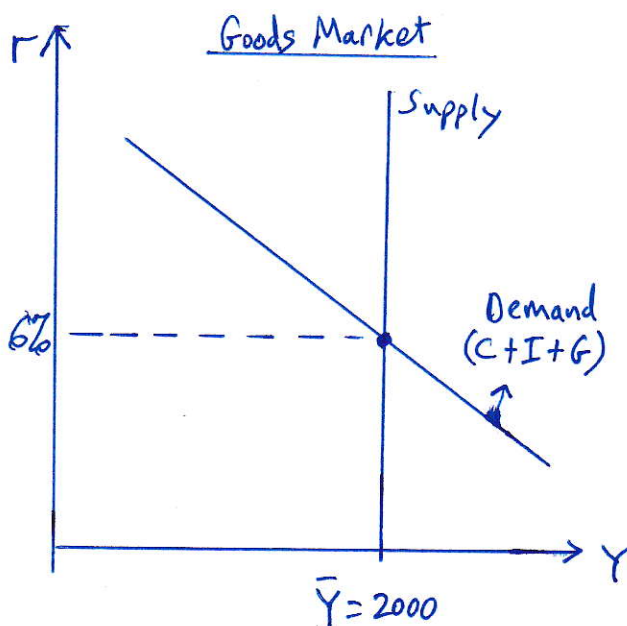
To find the equilibrium interest rate, we set $Y = C + I + G$.

$2000 = 260 + 0.8(2000 - 200) + 230 - 5r + 100$

$2000 = 2030 - 5r$

$5r = 30$

$r = 6\%$

(c) (10 pts) Assume a pandemic (e.g., coronavirus) reduces the labor force to $L = 81$ and makes consumers cautious so that the new consumption function is $C = 240 + 0.8(Y - T)$. Solve for the new equilibrium real interest rate and show the shifts in the goods & service market.
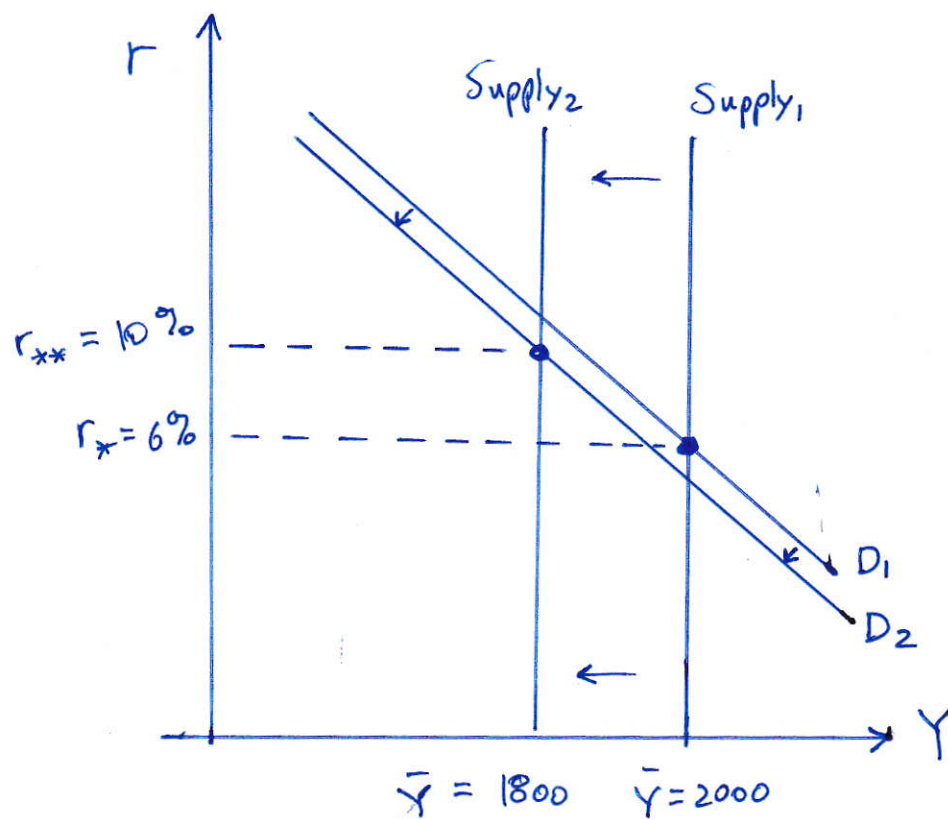
To find the new equilibrium interest rate, we again set $Y = C + I + G$.

$1800 = 240 + 0.8(1800 - 200) + 230 - 5r + 100$

$1800 = 1850 - 5r$

$5r = 50$

$r = 10\%$

#13. (15 pts) Circle the correct answer or complete the following statements to make them true.

(a) (2.5 pts) The current U.S. unemployment rate is <u>GREATER</u> / <u>LESS</u> than 4.0%.

(b) (2.5 pts) The approximate share of U.S. GDP going to workers is _____ 2/3 rds _____.

(c) (2.5 pts) Government spending is a <u>FLOW</u> / <u>STOCK</u> variable.

(d) (2.5 pts) The CPI may be an overestimate of the cost of living due to

___ substitution bias, introduction of new goods/services, or improvements of goods/services ___.

(e) (2.5 pts) Under the national income accounts, the adjustment for unpurchased inventory is counted as

_____ investment _____.

(f) (2.5 pts) The biggest component of consumption expenditures is

_____ services _____.