ECON 3010 Intermediate Macroeconomics
Solutions to Exam #1

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

#1. In any closed macroeconomy, national savings equals

a. consumption.
b. investment.
c. net exports.
d. output.

#2. The labor force participation rate rose between 1970 and 1990 primarily due to

a. baby boomers.
b. women entering the labor force.
c. the increase in agricultural productivity.
d. the rapid increase in college enrollment.

#3. When some of GDP is not purchased in a given year, it is

a. exported to other countries.
b. categorized as unplanned inventories under the investment category.
c. purchased by the federal government.
d. categorized as unplanned inventories under the consumption category.

#4. The largest component of aggregate expenditures is

a. imports.
b. government spending.
c. taxes.
d. consumption.

#5. Assume a country has a population of 80 million adults where 60 million people are in the labor force and 20 million people are unemployed. The economy has an

a. unemployment rate equal to 33% and a labor force participation rate equal to 75%.
b. unemployment rate equal to 25% and a labor force participation rate equal to 75%.
c. unemployment rate equal to 33% and a labor force participation rate equal to 60%.
d. unemployment rate equal to 25% and a labor force participation rate equal to 60%.

#6. Assume an economy experiences 10% growth in the labor force and the capital stock. If GDP increases by 15%, the economy has a production function with

a. an increasing marginal product of labor.
b. an increasing marginal product of capital.
c. <mark>increasing returns to scale.</mark>
d. constant returns to scale.

#7. The nominal wage is measured in units of

a. <mark>dollars per hour worked.</mark>
b. output per hours worked.
c. dollars per unit of capital.
d. output per unemployed person.

#8. A company with a marginal product of capital lower than its real rental rate

a. is maximizing its current profit.
b. should rent more capital.
c. <mark>should rent less capital.</mark>
d. is maximizing its total revenue.

#9. Which of the following macro variables is considered a stock?

a. GDP
b. <mark>the labor force</mark>
c. national savings
d. net exports

#10. Which item is the least likely to be included in the GDP deflator?

a. college tuition
b. <mark>new Toyota truck</mark>
c. government expenditures on roads & bridges
d. food and beverages

Problem Solving / Essay Questions. (75 points)

#11. (30 pts) Consider a macroeconomy that only produces tablets and smart phones. Use the information below to answer the following questions.

	Quantity (thousands)		Price (hundreds of dollars)	
Product	2010	2015	2010	2015
Tablets	50	70	$20	$40
Smart Phones	50	80	$10	$15

(a) (10 pts) Calculate nominal and real GDP for 2010 and 2015 using 2010 as the base year. What is the approximate growth rate in the economy over this period? Approximate annual growth rate?

SOLUTION:

- **2010 Nominal GDP = $(50 \times \$20) + (50 \times \$10) = \$1500$**

- **2015 Nominal GDP = $(70 \times \$40) + (80 \times \$15) = \$4000$**

- **2010 Real GDP = $\$1500$**

- **2015 Real GDP = $(70 \times \$20) + (80 \times \$10) = \$2200$**

- **Growth Rate in Real GDP (2010-2015) = $\frac{\$2200 - \$1500}{\$1500} \times 100 = 46.67\%$**

- **Approximate Annualized Growth Rate in Real GDP (2010-2015) = 9.33%**

(b) (10 pts) Assuming that the quantities in the table also represent the typical consumer's basket of goods, calculate the GDP deflator and CPI for 2010 and 2015 using 2010 as the base year.

SOLUTION:

- **2010 GDP Deflator = 100**

- **2015 GDP Deflator = $\frac{Nominal\ GDP}{Real\ GDP} \times 100 = \frac{\$4000}{\$2200} \times 100 = 181.8$**

- **2010 CPI = 100**

- **2015 CPI = $\frac{Cost\ of\ Basket\ in\ 2015\ dollars}{Cost\ of\ Basket\ in\ 2010\ dollars} \times 100 = \frac{\$2750}{\$1500} \times 100 = 183.3$**

(c) (10 pts) What are the inflation rates between 2010 and 2015 for the two price measures above? Give two reasons why the inflation rate (measured by the CPI) may overstate inflation.

SOLUTION:

- **The rates of inflation are….**
  - $\pi_{GDP\ deflator} = \frac{181.8-100}{100} \times 100 = 81.8\%$ **and**
  - $\pi_{CPI} = \frac{183.3-100}{100} \times 100 = 83.3\%$

- **The CPI inflation rate might overstate inflation because of a) the substitution effect if people switch to smart phones rather than tablets and b) because of quality improvements over time to both tablets and smart phones.**

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

Supply	Demand
$Y = F(K, L) = K^{1/3}L^{2/3}$	$C = 10 + 0.9(Y - T)$
$K = 125; L = 64$	$I = 12 - 2r$
	$G = 5, T = 10$

(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.

SOLUTION:

- **The level of GDP is** $Y = 125^{1/3}64^{2/3} = 5 \times 16 = 80$.

- **The amount going to workers is ...** $L \times \left(\frac{W}{P}\right) = L \times MPL = L \times \left(\frac{2}{3}\right)K^{\frac{1}{3}}L^{-\frac{1}{3}} = \left(\frac{2}{3}\right)K^{1/3}L^{2/3} = \left(\frac{2}{3}\right)125^{1/3}64^{2/3} = 160/3$.

- **The amount going to the owners of capital is ...** $K \times \left(\frac{R}{P}\right) = K \times MPK = K \times \left(\frac{1}{3}\right)K^{-\frac{2}{3}}L^{\frac{2}{3}} = \left(\frac{1}{3}\right)K^{1/3}L^{2/3} = \left(\frac{1}{3}\right)125^{1/3}64^{2/3} = 80/3$.

(b) (10 pts) Find the interest rate that produces equilibrium in the goods market. Use a demand-supply diagram to show how the equilibrium interest rate changes with a fiscal stimulus package that increases government spending.
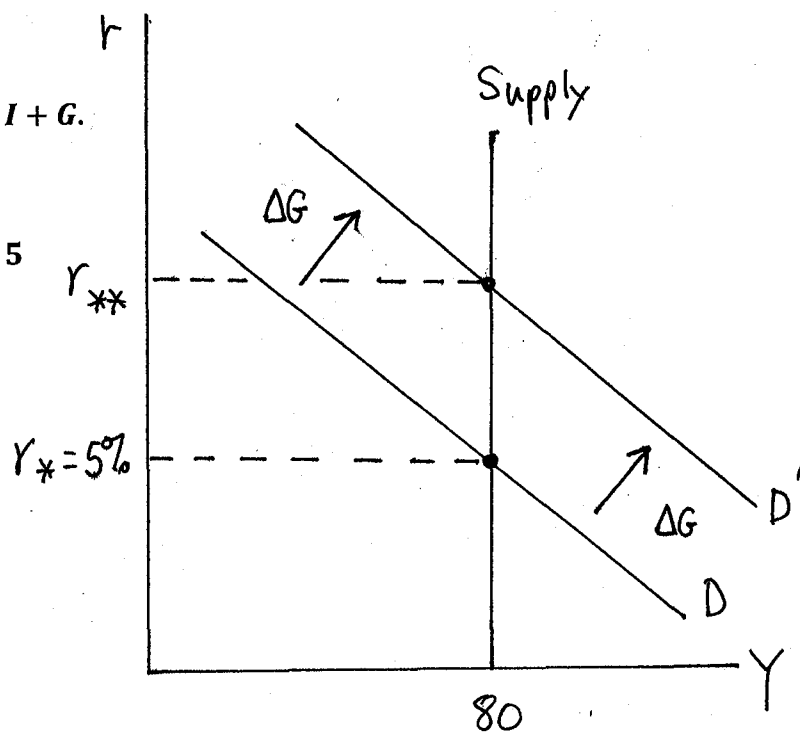
SOLUTION:

- **The equilibrium condition is:** $Y = C + I + G$. **Substitution gives...**

$$80 = 10 + 0.9(70) + 12 - 2r + 5$$

$$80 = 90 - 2r$$

$$r_* = 5\%$$

(c) (10 pts) Assume the fiscal stimulus package in part (b) increases government spending to $G = 6$. Find the new equilibrium interest rate and show that this new interest rate clears the market for loanable funds (i.e., causes national saving to equal investment).

- **The equilibrium condition is: $S = I$.**

$$S_{pr} + S_{pu} = I$$

$$Y - C - G = I$$

$$80 - 73 - 6 = 12 - 2r$$

$$r_{**} = 5.5\%$$

- **The new, higher interest rate clears the loanable funds market and the goods market.**

#13. (15 pts) Assume the currency (C) is \$500 billion and bank reserves (R) are \$2 trillion. The minimum allowable reserve requirement set by the Fed is 10% of deposits. Show all your calculations.

(a) (5 pts) What is the money supply if banks lend the maximum allowable and households do not hold any cash?

SOLUTION:

- **The money multiplier is $m = \dfrac{1+cr}{cr+rr} = \dfrac{1+0.0}{0.0+0.1} = \dfrac{1.0}{0.1} = 10$.**

- **The money supply is $M = m \times B = m \times (C + R) = 10 \times 2.5 = \$25$ trillion.**

(b) (5 pts) What is the money supply if households decide to hold 20% of deposits in the form of cash?

SOLUTION:

- **The money multiplier is $m = \dfrac{1+cr}{cr+rr} = \dfrac{1+0.2}{0.2+0.1} = \dfrac{1.2}{0.3} = 4$.**

- **The money supply is $M = m \times B = m \times (C + R) = 4 \times 2.5 = \$10$ trillion.**

(c) (5 pts) What is the money supply if banks become cautious about lending, and even though the minimum reserve requirement by law remains at 10%, banks decide to hold back 20% of deposits in reserves? Assume households still hold 20% of deposits as cash.

SOLUTION:

- **The money multiplier is $m = \dfrac{1+cr}{cr+rr} = \dfrac{1+0.2}{0.2+0.2} = \dfrac{1.2}{0.4} = 3$.**

- **The money supply is $M = m \times B = m \times (C + R) = 3 \times 2.5 = \$7.5$ trillion.**

(d) (BONUS – 5 pts) The Fed wishes to increase the money supply by 10%. Carefully describe two methods for doing this using the multiplier in part (a).

SOLUTION:

- **The Fed could change the reserve requirement to $rr = \frac{1}{11} = 9.1\%$ so the new money supply would be $M = m \times B = 11 \times 2.5 = \$27.5$ trillion.**
- **Alternatively, the Fed could increase bank reserves to \$2.25 trillion by purchasing \$250 billion of government securities on the open market.**