ECON 3010 Intermediate Macroeconomic Theory
Solutions to Homework #8

Ten *Sapling* multiple-choice questions. You have unlimited attempts to complete the assignment and they are due at midnight on the date above.

1. Graphically derive the IS and LM curves. Make sure to label all your axes and all the curves. Then type a brief paragraph for each derivation that explains all the steps clearly and concisely. It is fine to hand draw the graphs, but if you do, draw them neatly.

    SOLUTION. See Figure 11-7 and Figure 11-11, as well as the accompanying text, in Mankiw's e-book.

2. Chapter 11. Problems and Applications #2.

    SOLUTION.

    a. **Total planned expenditure is**

    $$PE = C(Y - T) + I + G.$$

    Plugging in the consumption function and the values for investment I, government purchases G, and taxes T given in the question, total planned expenditure PE is

    $$PE = 120 + 0.80(Y - 400) + 200 + 400$$

    $$= 0.80Y + 400.$$

    This equation is graphed in Figure 11-8.

Figure 11-8

PE = 0.80Y + 400

Y = PE

400

45

$Y^* = 2{,}000$

Income, output
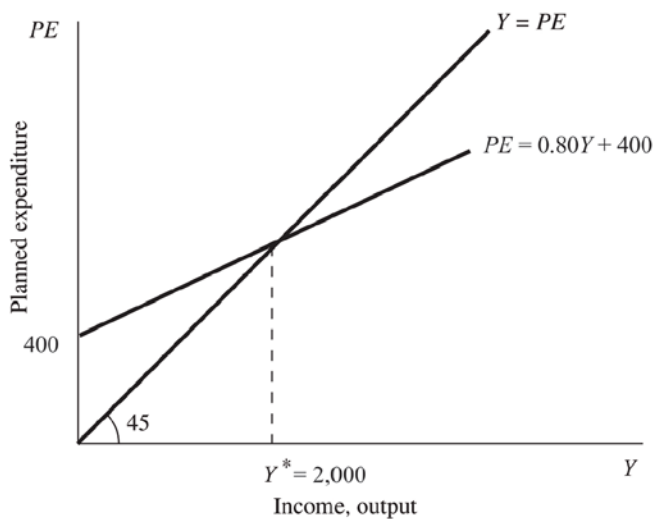
b. **To find the equilibrium level of income, combine the planned-expenditure equation derived in part (a) with the equilibrium condition $Y = PE$:**

$$Y = 0.80Y + 400$$

$$Y = 2{,}000.$$

The equilibrium level of income is 2,000, as indicated in Figure 11-8.

c. **If government purchases increase to 420, then planned expenditure changes to $PE = 0.80Y + 420$. Equilibrium income increases to $Y = 2{,}100$. Therefore, an increase in government purchases of 20 (i.e., 420 – 400 = 20) increases income by 100. This is what we expect to find, because the formula for the government-purchases multiplier is $1/(1 – MPC)$, the MPC is 0.80, and the government-purchases multiplier therefore has a numerical value of 5.**

d. **An income level of 2,400 represents an increase of 400 over the original level of income. The government-purchases multiplier is $1/(1 – MPC)$: the MPC in this example equals 0.80, so the government-purchases multiplier is 5. This means that government purchases must increase by 80 (to a level of 480) for income to increase by 400.**

e. **An income level of 2,400 represents an increase of 400 over the original level of income. The tax multiplier is $–MPC/(1 – MPC)$: the MPC in this example equals 0.80, so the tax multiplier is 4. This means that taxes must decrease by 100 (to a level of 300) for income to increase by 400.**

3. Chapter 11. Problems and Applications #6.

   SOLUTION.

a. **The variable Y represents real output or real income. From Chapter 2, we know that the value of the produced goods and services (real output) has to be equal to the value of the income earned in producing the goods and services (real income). The variable C represents the consumption of goods and services. The variable I represents investment by the firms. When firms purchase new capital goods, it counts as investment. When firms experience a change in their inventories, it also counts in the investment category of GDP. The variable G represents the government's spending on newly produced goods and services. The variable T represents lump sum taxes, and $Y - T$ represents disposable income. The variable M represents the nominal money supply, P is the price level, and M/P is the real money supply. The variable r is the real interest rate. The variable $(M/P)^d$ represents real money demand. Consumption depends positively on disposable income, investment depends negatively on the real interest rate, and real money demand depends positively on real income and negatively on the real interest rate.**

b. **The IS curve represents all combinations of the real interest rate r and real output Y such that the goods market is in equilibrium. The equation for the IS curve can be derived as follows:**

$$Y = C + I + G$$

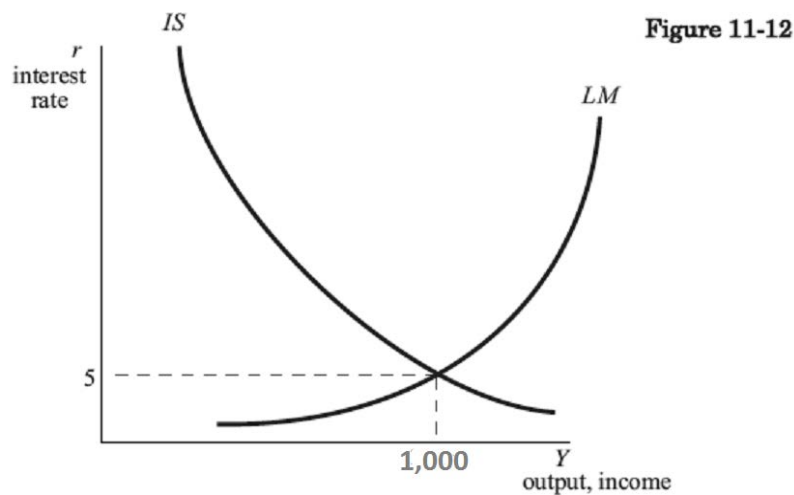$$Y = [50 + 0.75(Y - T)] + (150 - 10r) + 250$$

$$Y = [50 + 0.75(Y - 200)] + (150 - 10r) + 250$$

$$Y = 300 + 0.75Y - 10r$$

$$0.25Y = 300 - 10r$$

$$Y = 1{,}200 - 40r$$

The IS curve is illustrated in Figure 11-12 (but should be drawn linearly).

Figure 11-12

c. The *LM* curve represents all combinations of the real interest rate *r* and real output *Y* such that the money market is in equilibrium. The equation for the *LM* curve can be derived as follows:

$$\left(\frac{M}{P}\right)^d = \frac{M}{P}$$

$$Y - 50r = \frac{3,000}{4}$$

$$Y = 750 + 50r.$$

The *LM* curve is illustrated in Figure 11-12 (but should be drawn linearly).

d. To find the equilibrium levels of the interest rate and output (or income), set the equation for the *IS* curve equal to the equation for the *LM* curve and solve for the interest rate *r* to get 5. Now substitute the interest rate of 5 back into either equation to solve for *Y* equal to 1,000.

4. Chapter 12. Problems and Applications #1.

SOLUTIONS.

a. If the central bank increases the money supply, then the *LM* curve shifts downward, as shown in Figure 12-4. Income increases and the interest rate falls. The increase in disposable income causes consumption to rise; the fall in the interest rate causes investment to rise as well.
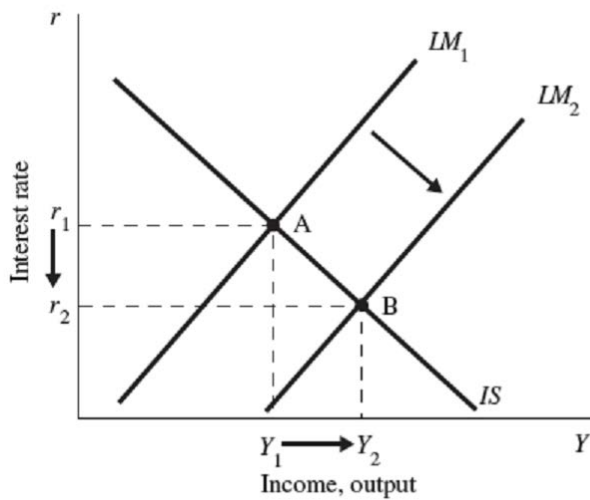
Figure 12-4

b. If government purchases increase, then the government-purchases multiplier tells us
    that the *IS* curve shifts to the right by an amount equal to $[1/(1 – MPC)]\Delta G$. This is
    shown in Figure 12-5. Income and the interest rate both increase. The increase in
    disposable income causes consumption to rise, while the increase in the interest rate
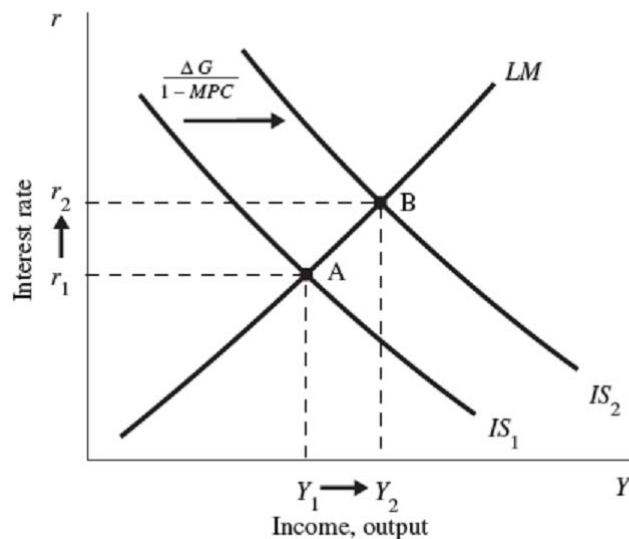   causes investment to fall.

Figure 12-5

c. If the government increases taxes, then the tax multiplier tells us that the *IS* curve
    shifts to the left by an amount equal to $[–MPC/(1 – MPC)]\Delta T$. This is shown in
    Figure 12-6. Income and the interest rate both fall. Disposable income falls because

income is lower and taxes are higher; this causes consumption to fall. The fall in the interest rate causes investment to rise.
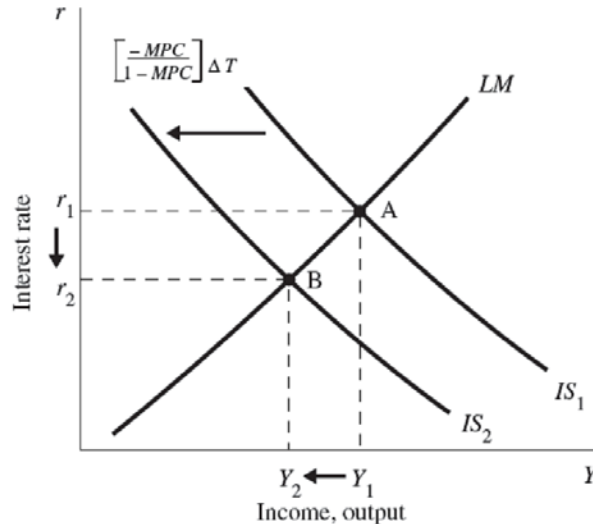

Figure 12-6

d. **We can figure out how much the *IS* curve shifts in response to an equal increase in government purchases and taxes by adding together the two multiplier effects that we used in parts (b) and (c):**

$$\Delta Y = \{[(1/(1 - MPC)]\Delta G\} - \{[MPC/(1 - MPC)]\Delta T\}$$

Because government purchases and taxes increase by the same amount, we know that $\Delta G = \Delta T$. Therefore, we can rewrite the above equation as:

$$\Delta Y = [(1/(1 - MPC)) - (MPC/(1 - MPC))]\Delta G$$

$$\Delta Y = \Delta G.$$

This expression tells us how output changes, holding the interest rate constant. It says that an equal increase in government purchases and taxes shifts the *IS* curve to the right by the amount that G increases.

This shift is shown in Figure 12-7. Output increases, but by less than the amount that G and T increase; this means that disposable income $Y - T$ falls. As a result, consumption also falls. The interest rate rises, causing investment to fall.
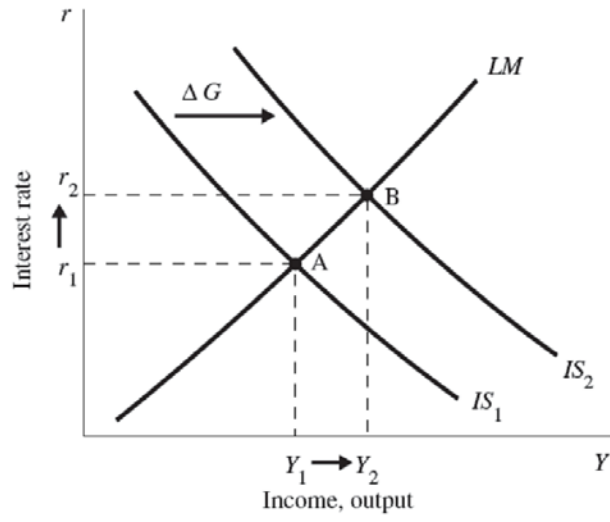
Figure 12-7