2.

a. The downward sloping line in Figure 11–11 represents the money demand function $(M/P)^d = 1{,}000 - 100r$. With $M = 1{,}000$ and $P = 2$, the real money supply $(M/P)^s = 500$. The real money supply is independent of the interest rate and is, therefore, represented by the vertical line in Figure 11-11.

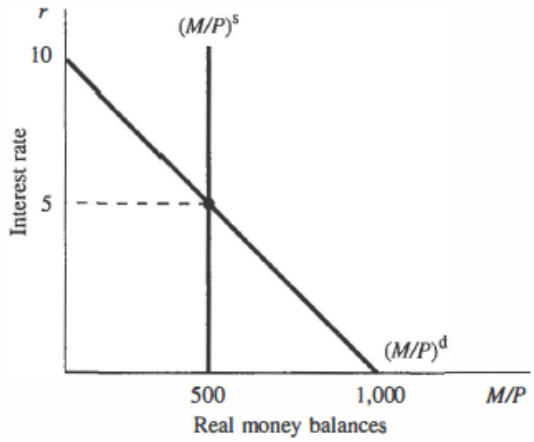

Figure 11-11

b. We can solve for the equilibrium interest rate by setting the supply and demand for real balances equal to each other:

$$500 = 1{,}000 - 100r$$
$$r = 5.$$

Therefore, the equilibrium real interest rate equals 5 percent.

c. If the price level remains fixed at 2 and the supply of money is raised from 1,000 to 1,200, then the new supply of real balances $(M/P)^s$ equals 600. We can solve for the new equilibrium interest rate by setting the new $(M/P)^s$ equal to $(M/P)^d$:

$$600 = 1{,}000 - 100r$$
$$100r = 400$$
$$r = 4.$$

Thus, increasing the money supply from 1,000 to 1,200 causes the equilibrium interest rate to fall from 5 percent to 4 percent.

d. To determine at what level the Fed should set the money supply to raise the interest rate to 7 percent, set $(M/P)^s$ equal to $(M/P)^d$:

$$M/P = 1{,}000 - 100r.$$

Setting the price level at 2 and substituting $r = 7$, we find:

$$M/2 = 1{,}000 - 100 \times 7$$
$$M = 600.$$

For the Fed to raise the interest rate from 5 percent to 7 percent, it must reduce the nominal money supply from 1,000 to 600.

3.

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, this counts as investment. When firms experience a change in their inventories, this 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:

$$Y = C + I + G$$
$$Y = (120 + 0.5(Y - T)) + (100 - 10r) + 50$$
$$Y = (120 + 0.5(Y - 40)) + (100 - 10r) + 50$$
$$Y = 250 + 0.5Y - 10r$$
$$0.5Y = 250 - 10r$$
$$Y = 500 - 20r$$

The IS curve is illustrated in Figure 11-12.

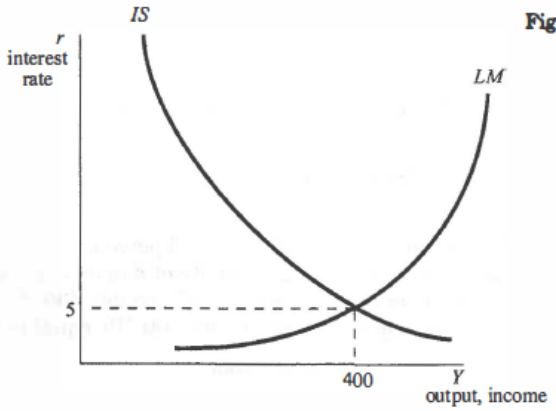

Figure 11-12

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:

$$\left(\frac{M}{P}\right)^d = \frac{M}{p}$$
$$Y - 20r = \frac{600}{2}$$
$$Y = 300 + 20r.$$

The LM curve is illustrated in Figure 11-12.

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 400.

4.

a. The goods market is in equilibrium when output is equal to planned expenditure, or $Y = PE$. Starting with this equilibrium condition, and making the substitutions from the information given in the problem, results in the following expression for equilibrium output Y:

$$Y = C + I + G$$

$$Y = C(Y - T) + I(r) + G$$

$$Y = a + b(Y - T) + c - dr + G$$

$$(1 - b)Y = a - bT + c - dr + G$$

$$Y = \frac{a - bT + c - dr + G}{1 - b}$$

b. The slope of the IS curve is measured as

$$\frac{\Delta r}{\Delta Y}.$$

From the equation in part (a), the slope of the IS curve can be found as follows:

$$\frac{\Delta r}{\Delta y} = \frac{1}{(\Delta Y / \Delta r)} = \frac{1}{-(d/(1-b))} = -\frac{(1-b)}{d}.$$

Mathematically, as the parameter d becomes a larger number, the slope becomes a smaller number in absolute value terms and the IS curve becomes flatter. Intuitively, if the parameter d is a larger number, then investment is more responsive to changes in the interest rate. Any given decrease in the interest rate will cause a larger increase in investment and, via the multiplier effect, cause a larger increase in equilibrium output Y. This makes the IS curve flatter.

c. A \$100 increase in government spending will cause a larger horizontal shift in the IS curve than a \$100 tax cut. From the equation for equilibrium output in part (a), note that the impact of the tax cut depends on the marginal propensity to consume, as given by the parameter b. If the MPC is 0.75, for example, then a \$100 tax cut will shift the IS curve by only \$75. Intuitively, this makes sense because the entire \$100 increase in government spending will be spent, whereas only a portion of the tax cut will be spent, and the rest will be saved depending on the size of the MPC.

d. Money-market equilibrium occurs where the demand for real balances is equal to the supply of real balances. Using the given information about the demand for real balances, we can solve for the equilibrium interest rate:

$$\frac{M}{P} = L(r, Y) = eY - fr$$

$$fr = eY - \frac{M}{P}$$

$$r = \frac{eY}{f} - \frac{M}{fP}.$$

e. The slope of the *LM* curve is measured as

$$\frac{\Delta r}{\Delta Y}.$$

From the equation in part (d), the slope of the *LM* curve is e/f. As the parameter f becomes a larger number, the slope becomes smaller and the *LM* curve becomes flatter. Intuitively, as the parameter f becomes a larger number, money demand is more responsive to changes in the interest rate. This means that any increase in income that leads to an increase in money demand will require a relatively small increase in the interest rate to restore equilibrium in the money market.

f. The size of the horizontal shift in the *LM* curve caused by a change in the money supply M can be measured by looking at where the *LM* curve crosses the horizontal axis. From the equation in part (d), set r equal to zero and solve for Y to find the horizontal intercept: the *LM* curve crosses the horizontal axis where $Y = M/eP$. Mathematically, a $100 change in the money supply has a smaller effect on the horizontal intercept the larger the value of the parameter e. When the parameter e is larger, money demand is more responsive to changes in income Y, and the *LM* curve is steeper. Intuitively, if income increases and the parameter e is relatively larger, then money demand increases by a larger amount. This then requires a larger increase in the interest rate to restore money-market equilibrium and the *LM* curve becomes relatively steeper. Overall, the increase in the money supply will lower the interest rate and increase investment spending and output. When output rises, so does money demand, and if the parameter e is relatively large, then the interest rate will need to rise by a larger amount to restore equilibrium in the money market. The overall effect on equilibrium output is relatively smaller, as given by the smaller horizontal shift in the *LM* curve. The parameter f has no effect on the size of the horizontal shift in the *LM* curve caused by a change in the money supply. The parameter f affects the vertical shift and the slope of the *LM* curve but not the horizontal shift.

g. To derive the aggregate demand curve, substitute the result for part (d) into the result for part (a) and solve for Y:

$$Y = \frac{a - bT + c + G}{1-b} - \frac{d}{1-b}\left(\frac{eY}{f} - \frac{M}{fP}\right)$$

$$Y\left(1 + \frac{de}{f(1-b)}\right) = \frac{1 - bT + c + G}{1-b} + \frac{dM}{f(1-b)P}$$

$$Y = \frac{f(a - bT + c + G)}{f(1-b) + de} + \frac{dM}{\left[f(1-b) + de\right]P}.$$

h. The aggregate demand curve has a negative slope, as can be seen from the equation in part (g) above. An increase in the price level P will decrease the value of the second term on the right-hand side, and therefore output Y will fall.

i. An increase in the money supply, an increase in government spending, and a decrease in taxes all shift the aggregate demand curve to the right, as can be seen from the equation for the aggregate demand curve found in part (g). Looking at the first term on the right-hand side, we see that an increase in G or a decrease in T will increase the value of this term and shift the aggregate demand curve to the right. Looking at the second term on the right-hand side, an increase in the money supply for any given value of the price level will increase the value of output and therefore shift the aggregate demand curve to the right. If the parameter f has a value of zero, then the first term on the right-hand side is zero and changes in government spending and taxes do not affect the aggregate demand curve. In this case, the *LM* curve is vertical and changes in fiscal policy that shift the *IS* curve have no effect on output. Monetary policy is still effective in this case, and an increase in the money supply will still shift the aggregate demand curve to the right. In this case, the aggregate demand curve is given by:

$$Y = \frac{M}{eP}.$$