Problem 1. Expansionary monetary policy works through the following mechanism:

(a) fed funds rate $\downarrow$ $\Longrightarrow$ other interest rates $\downarrow$ $\Longrightarrow$ real interest rates $\downarrow$ $\Longrightarrow$ quantity of loanable funds demanded $\uparrow$ $\Longrightarrow$ demand for goods and services $\uparrow$ $\Longrightarrow$ employment and GDP $\uparrow$

(b) fed funds rate $\downarrow$ $\Longrightarrow$ other interest rates $\downarrow$ $\Longrightarrow$ real interest rates $\downarrow$ $\Longrightarrow$ quantity of loanable funds demanded $\downarrow$ $\Longrightarrow$ demand for goods and services $\downarrow$ $\Longrightarrow$ employment and GDP $\downarrow$

(c) fed funds rate $\uparrow$ $\Longrightarrow$ other interest rates $\uparrow$ $\Longrightarrow$ real interest rates $\uparrow$ $\Longrightarrow$ quantity of loanable funds demanded $\downarrow$ $\Longrightarrow$ demand for goods and services $\downarrow$ $\Longrightarrow$ employment and GDP $\downarrow$

(d) fed funds rate $\uparrow$ $\Longrightarrow$ other interest rates $\uparrow$ $\Longrightarrow$ real interest rates $\uparrow$ $\Longrightarrow$ quantity of loanable funds demanded $\uparrow$ $\Longrightarrow$ demand for goods and services $\uparrow$ $\Longrightarrow$ employment and GDP $\uparrow$

Answer 1: a. Expansionary policy makes lending cheaper by driving down the real interest rate temporarily, which in turn boosts the economy. Contractionary policy is option (c), whereby the Fed drives up the real interest rate, which in turn slows the economy.

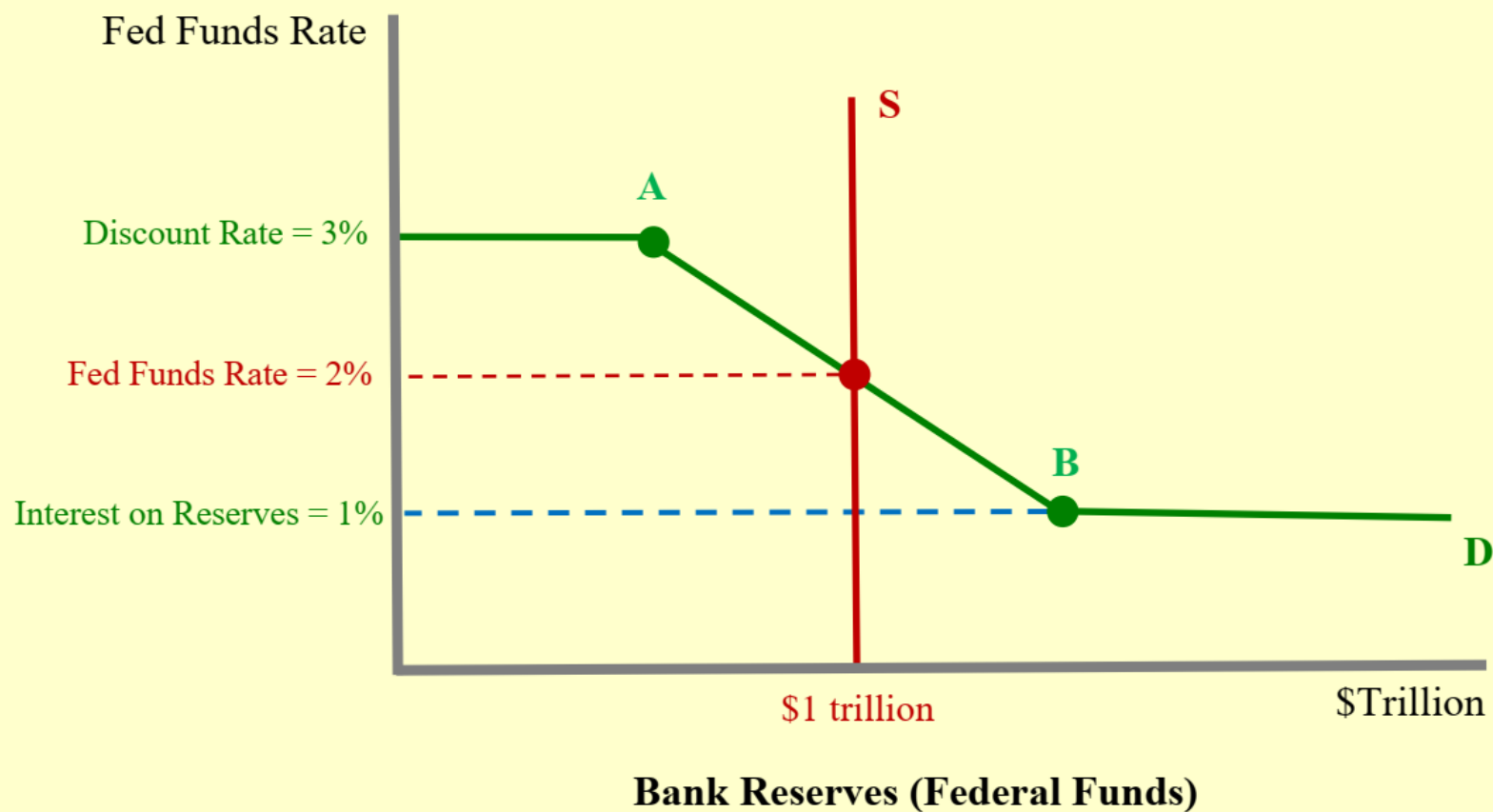**Problem 2.** The Federal Reserve has four tools it can use to affect interest rates in the economy. They are:

(a) the required reserve ratio

(b) open market operations

(c) the discount rate

(d) interest on reserves

(e) all of the above

(f) none of the above

Answer 2: e.   Interest rates are determined largely by the market for reserves (there is a nearly one-to-one relationship between federal funds rate and 1-year Treasury bond rates). **Expansionary** policy means the federal funds rate decreases, and **contractionary** policy means the federal funds rate increases. For example,

- *required reserve ratio*: if banks are required to hold more reserves, then the demand for reserves increases (*contractionary*)

- *open market operations*: if the Fed injects reserves into the banking system (an open market purchase of bonds from banks), then the supply of reserves increases (*expansionary*)

- *discount rate:* if the Fed lowers the discount rate, then banks are willing to borrow more funds from the Fed, provided the supply of reserves is sufficiently low (*expansionary*)

- *interest on reserves:* if the Fed increases interest paid on reserves, then banks are less willing to lend at low interest rates, provided the supply of reserves is sufficiently high (*contractionary*)

As you might imagine, the reverse cases have the opposite effects.

Figure 4: Equilibrium Federal Funds Rate

Fed Funds Rate

S

A

Discount Rate = 3%

Fed Funds Rate = 2%

B

Interest on Reserves = 1%

D

$1 trillion

$Trillion

Bank Reserves (Federal Funds)

Problem 3. What is the *effective lower bound* and why does it warrant the use of *quantitative easing*?

Answer 3. The **effective lower bound (ELB)** is the lowest rate that nominal interest rates can reach. For a long time this was thought to be zero, but some countries have had sustained negative interest rates, for example in Switzerland.

When the economy has hit the ELB, the Fed cannot rely on traditional open market purchases. Instead they can try **quantitative easing** to stimulate the economy, which involves the purchase of long-term securities, including private assets like mortgage-backed securities. Quantitative easing policy is controversial because it is unconventional and because its effectiveness has not been demonstrated (nor has it been rejected).

Problem 4. The table below shows production and expenditure data for three coun-
tries.

	Country 1	Country 2	Country 3
C	12	10	16
I	4	8	6
G	10	12	7
EX	6	5	3
IM	2	4	6
Y	30	35	25

In Country 2,

(a) the goods market is in equilibrium
(b) there is excess demand for goods and services
(c) there is excess supply of goods and services
(d) there is an unplanned decrease in inventories
(e) none of the above

Answer 4: c.   Actual demand is equal to

$$C + I + G + EX - IM = 10 + 8 + 12 + 5 - 4 = 31,$$

whereas output is

$$Y = 35.$$

This means that more is being produced than people want to buy—there is excess supply of goods and services. This causes an unplanned increase in inventories of $35 - 31 = 4$. Firms will ultimately respond by producing less stuff so that their production matches demand.

Problem 5. Which of the following sequences of events is one of the explanations for the slope of the AD function?

(a) $P \downarrow \implies$ Real Wealth $\uparrow \implies C \uparrow \implies AD \uparrow \implies Y \uparrow$

(b) $P \downarrow \implies$ Real Wealth $\downarrow \implies C \uparrow \implies AD \uparrow \implies Y \uparrow$

(c) $P \downarrow \implies$ Real Wealth $\uparrow \implies C \downarrow \implies AD \uparrow \implies Y \uparrow$

(d) $P \uparrow \implies$ Real Wealth $\uparrow \implies C \uparrow \implies AD \uparrow \implies Y \uparrow$

Answer 5: a. If the price level goes down, then all else the same, real wealth goes up—it costs less to buy things so you're relatively wealthier. Thus you will consume more, which causes an increase in Y via C. This is the **wealth effect**.

Problem 6. Which of the following sequences of events is one of the explanations for the slope of the AD function?

(a) $P \downarrow \implies (EX - IM) \downarrow \implies AD \uparrow \implies Y \uparrow$

(b) $P \uparrow \implies (EX - IM) \uparrow \implies AD \uparrow \implies Y \uparrow$

(c) $P \downarrow \implies (EX - IM) \uparrow \implies AD \uparrow \implies Y \uparrow$

(d) $P \uparrow \implies (EX - IM) \downarrow \implies AD \uparrow \implies Y \uparrow$

Answer 6: c. If the domestic price level (i.e. "our" price level) goes down, then two things happen:

- we buy more domestic goods and import less

- foreign people buy more of our goods and therefore we export more.

Both effects will increase Y. This is the **foreign trade effect.**

Problem 7.   Which of the following sequences of events is one of the explanations for the slope of the AD function?

(a) $P \downarrow \implies$ Money Demand $\uparrow \implies R \uparrow \implies r^e \uparrow \implies C + I \uparrow \implies AD \uparrow \implies Y \uparrow$

(b) $P \downarrow \implies$ Money Demand $\downarrow \implies R \downarrow \implies r^e \downarrow \implies C + I \uparrow \implies AD \uparrow \implies Y \uparrow$

(c) $P \downarrow \implies$ Money Demand $\downarrow \implies R \uparrow \implies r^e \uparrow \implies C + I \uparrow \implies AD \uparrow \implies Y \uparrow$

(d) $P \uparrow \implies$ Money Demand $\uparrow \implies R \uparrow \implies r^e \uparrow \implies C + I \uparrow \implies AD \uparrow \implies Y \uparrow$

Answer 7: b.   If the price level goes down, demand for money will decrease (people don't need as much money to buy things anymore if prices are lower). This will cause a decrease in the interest rate R. Lower R will make borrowing cheaper so people and firms will be inclined to borrow and thus spend more. This increases AD and Y. This is the **interest rate effect**.

Problem 8. The graph below shows a linear consumption function for a country. What is the marginal propensity to consume (MPC), for this country? What is the marginal propensity to save (MPS)?
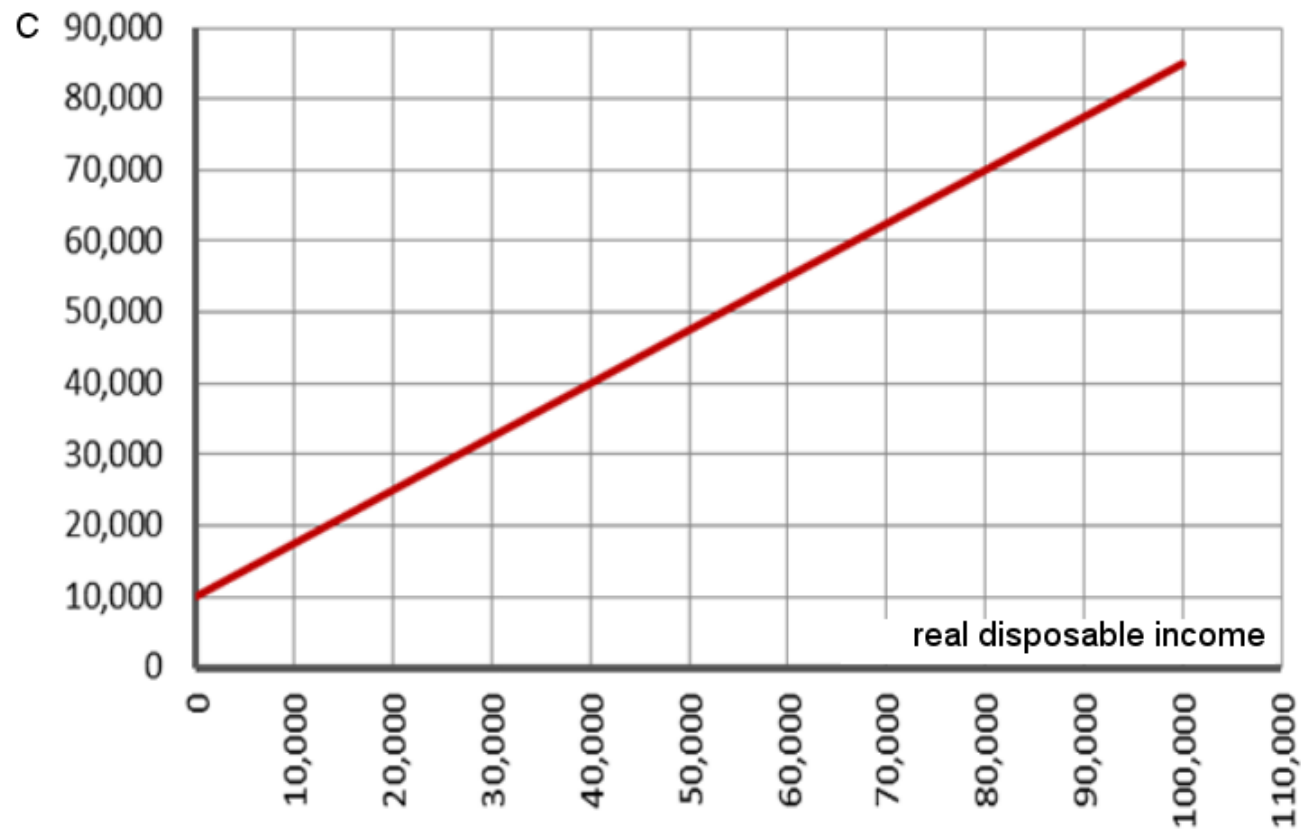
Answer 8: a. The MPC is just the slope of the line. It captures how consumption changes in response to changes in disposable income Y_d. I'll pick two points that line up nicely with the grid: $(0, 10000)$ and $(40000, 40000)$. Rise over run.

$$MPC = \frac{30000}{40000} = 0.75.$$

What this means is that people will spend 75 cents of every additional (i.e. marginal) dollar of disposable income they receive. Note that what is not consumed is saved, so the marginal propensity to save is

$$MPS = 1 - MPC = 0.25$$

Problem 9. Suppose that MPC is 0.75. The government increases taxes by 10,000 units. What is the initial effect on disposable income and consumption?

Answer 9. We first see how an increase in taxes affect disposable income, which is defined as

$$Y_d \equiv Y - TX + TR \implies \Delta Y_d = \Delta Y - \Delta TX + \Delta TR.$$

We are told that $\Delta TX = 10,000$, therefore $\Delta Y_d = -10,000$.

The MPC then tells how how much consumption changes when Y_d changes, that is, $\Delta C = MPC \times \Delta Y_d$. Disposable income goes down by 10,000, the MPC is 0.75, therefore consumption goes down by $-7,500$.

Problem 10. Suppose government expenditures are increased by 100 units and the MPC is 0.75. Which of the following captures the expenditure multiplier process?

(a) $\Delta AD = 100 + 100 \times 0.75 + 100 \times 0.75^2 + 100 \times 0.75^3 + \ldots = 100 \times \frac{1}{1-0.75} = 400$

(b) $\Delta AD = 100$

(c) $\Delta AD = -100 - 100 \times 0.75 - 100 \times 0.75^2 - 100 \times 0.75^3 - \ldots = -100 \times \frac{1}{1-0.75} = 400$

(d) $\Delta AD = -100$

(e) none of the above

Answer 10: a. It's helpful to break up the narrative into different rounds of spending.

- *First round of spending*: G goes up by 100. The gov't spends that money for, say, construction, and hence that 100 becomes the income of construction workers.

- *Second round of spending*: Because the MPC is 0.75, it means the construction workers spend 0.75×100 of that on consumption, so C goes up by 0.75×100. The construction workers spend that new income at, say, the grocery store, so that 0.75×100 becomes the income of the grocery store workers.

- *Third round of spending*: Because the MPC is 0.75, it means the grocery store workers spend $0.75 \times (0.75 \times 100)$ of their new income on, say, hair transplants because the cruel mistress of time is giving their precious hairlines a smackdown. This means that C has gone up by $0.75 \times (0.75 \times 100)$.

Etc etc, ad infinitum. The total change in AD is as shown in option (a), where the sum of all rounds constitutes a *geometric series* which converges to a number called the

$$\textbf{expenditure multiplier} \equiv \frac{1}{1 - MPC}.$$

Also note that when there are changes in taxes or transfer payments, you first convert those into changes in C (like in Problem 9) to get the first round of spending.