Answer Key to Midterm Exam #2

1. Multiple Choice:

1) C
2) A
3) C
4) D
5) D
6) D
7) D
8) C
9) A
10) C
11) D
12) D
13) A
14) C
15) C
16) A
17) C
18) B
19) A
20) A
21) A
22) B
23) C
24) D
25) C
26) D
27) A
28) C
29) B

If you have questions regarding these questions please contact me.

2. Bonus Multiple Choice:

30)

Answer: A
Explanation: The investment demand curve shows the relationship between interest rates and the amount firms want to spend on investment. If interest rates fall, firms move along the investment demand curve and demand more investment goods. If technology improves, firms want to buy the equipment that allows them to take advantage of the new technology. This appears as a rightward shift of the investment demand curve.
31)  
**Answer: B**  
Explanation: The aggregate demand shortfall is the size of the shift of the aggregate demand curve that is required to increase equilibrium output so that it equals full-employment output.

32)  
**Answer: B**  
Explanation: The necessary fiscal stimulus equals the aggregate demand shortfall divided by the multiplier. The value of the multiplier in this case is 10, which is calculated as 1 divided by (1 minus 0.9). The aggregate demand shortfall of $20 million divided by 10 is $2 million.

33)  
**Answer: D**  
Explanation: Income transfers are payments to individuals for which no goods or services are exchanged. Unemployment benefits are paid to sustain people during a period of unemployment and are not given in exchange for work or services.

34)  
**Answer: C**  
Explanation: Families treat income transfers as additional income. As such, some of this additional income is devoted to additional consumption spending and part is saved. It is only the part that is spent that provides a fiscal stimulus. On the other hand, the entire amount of money allocated for government purchases is spent. Each dollar of government purchases is a dollar of stimulus.

35)  
**Answer: D**  
Explanation: An increase in government purchases produces a fiscal stimulus equal to the increase in government purchases. A tax cut does not. Although a tax cut provides a stimulus, that stimulus occurs only from the part of the tax cut that is spent. The part that is saved does not generate a fiscal stimulus. The part of the tax cut that is spent is equal to the MPC times the tax cut. In this problem, that would be 0.9 times $1,000, which equals $900. This equals the stimulus generated by a $900 increase in government purchases.

3. Short Answers

1. **Scenario**  
Below are data on disposable income, consumption, and other variables for a four-year period for the economy of Gopherville. As you can tell, some of the data are missing and you will be asked to calculate some of the missing values.

<table>
<thead>
<tr>
<th></th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable Income</td>
<td>$10,000</td>
<td>$9,000</td>
<td>$13,000</td>
<td>$17,000</td>
</tr>
<tr>
<td>Consumption Spending</td>
<td>$9,000</td>
<td>$9,000</td>
<td>$15,000</td>
<td></td>
</tr>
<tr>
<td>Saving</td>
<td>$250</td>
<td></td>
<td>$1,000</td>
<td></td>
</tr>
<tr>
<td>Marginal Propensity to Consume (MPC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**a.** What was consumption spending in 1999?  

$**9750**

Please enter a whole number, with no decimal point.

Explanation: Consumption spending plus saving equals disposable income. In other words, families either spend their disposable income on consumption or they save. Because disposable income is $10,000, consumption spending is $10,000 - $250 = $9,750
b. What was saving in 2002?

$2000
Please enter a whole number, with no decimal point.

Explanation: Since disposable income is $17,000 and consumption is $15,000, this means households are saving $2,000 of their disposable income. Households divide their disposable income between consumption and saving:
Disposable Income = Consumption + Saving
$17,000 = $15,000 + Saving
$2,000 = Saving

c. What is the MPC?
0.75
Please enter 2 digits after the decimal point.

Explanation: The MPC is the change in consumption spending (C) divided by the change in disposable income (DI):
MPC = Change in C / Change in DI
To calculate its value, you must determine changes in consumption and disposable income. For example, from 2001 to 2002, disposable income increased from $13,000 to $17,000 for an increase of $4,000. At the same time, consumption spending increased from $12,000 to $15,000 for a gain of $3,000. Applying the values to the formula, you arrive at the answer:
MPC measures the fraction of any additional disposable income that will be consumed, that is, spent on goods and services.
MPC = $3,000 / $4,000 = 0.75

2. Scenario
Economists in Blueberg have determined that Blueberg's consumption function is
C = 4,000 + 0.8Y0, where C is consumption spending and Y0 is disposable income.

a. What is the marginal propensity to consume (MPC) in Blueberg?
0.8
Please enter 1 digit after the decimal point.

Explanation:
In the consumption function equation, the coefficient of disposable income (Y0) is the marginal propensity to consume. In this equation, that coefficient is 0.8.

b. What is consumption spending when disposable income is $25,000?

$24000
Please enter a whole number, with no decimal point.

Explanation:
To calculate the amount of consumption spending when disposable income is $25,000, substitute $25,000 for Y0 in the equation and solve. Consumption is therefore:
C = $4,000 + 0.8 ($25,000) = $24,000

c. How much will people in Blueberg save when disposable income is $20,000?

$0
Please enter a whole number, with no decimal point.
Explanation: When income is $20,000, consumption spending is:
\[ C = 4000 + 0.8 \times (20000) = 20000 \]
Because all income is being spent on goods and services, there is no saving.

d. Assume the stock market in Blueberg collapses and families find that their wealth has declined.
Which of the following is consistent with this decline in family wealth?

A. The MPC in Blueberg rises.
B. The MPC in Blueberg falls.
C. Autonomous consumption in Blueberg rises.
D. Autonomous consumption in Blueberg falls.

Your choice is: **D** (no need to explain).

Explanation: **Autonomous consumption is the part of consumption spending that is not determined by income.** Such things as consumer expectations, credit availability and cost, and wealth determine the amount of autonomous consumption. A decline in wealth will cause families to reduce their consumption spending, which appears as a decline in autonomous consumption.

3. State whether the following events will shift the **AE** curve and/or the **AD** curve. (For each case, assume that other variables remain constant.) (No need to explain)

In general, any change that changes autonomous spending shifts the **AE** curve. Therefore all the changes shift the **AE** curve. And any change in autonomous expenditure not the result of a change in the price level shifts the **AD** curve. Therefore part (a) involves a movement along an **AD** curve and parts (b) through (d) create shifts in the **AD** curve.

a. A rise in the price level.

**The rise in the price level shifts the **AE** curve downward and creates a movement upward along the **AD** curve.**

b. A rise in expected future profits for businesses.

**The rise in future expected profits increases investment, thereby shifting the **AE** curve upward and the **AD** curve rightward.**

c. A tax cut.

**The decrease in taxes increases consumption expenditure and shifts the **AE** curve upward and the **AD** curve rightward.**

d. An increase in government purchases.

**An increase in government purchases shifts the **AE** curve upward and the **AD** curve rightward.**
4. The Neoclassical Model of Flexible Prices

Model Setting:
1. Suppose an economy consists of 30 identical households and 5 identical firms.
2. Each firm has the following production technology: \( y_x = I_D^{2/3} \), which means the firms use only labor to produce the only good in the economy (bread, for example), taking technology and capital levels as given. The output (bread) is measured in terms of certain units, and you can think of this unit to be loaves (for bread) or pounds.
3. Each household wants to maximize its utility which depends on the amount of bread (output) it wants to consume or demand, \( y_D \), and the number of leisure hours it enjoys, \( 24 - l_x \) (where \( l_x \) denotes the labor supply for a single household or the amount of working hours it chooses, and we assume each household consists of one person who only has 24 hours a day). The utility function is: \( U = y_D^{1/4} (24 - l_x)^{3/4} \).
4. Let \( p \) be the price level in the market for goods and services (how much one has to pay for one unit of output/bread).
5. Let \( w \) be the money wage rate in the labor market (how much one gets for working one hour).
6. For simplicity we assume all profits are retained by firms and not redistributed to households.

Questions:
1. Please write down the household’s optimization problem. (Hint: write down both the utility maximization equation and the budget constraint in the form I gave you in class.)

The Household’s optimization problem should be formulated like this:

\[
\begin{align*}
\text{Max} & \quad U = y_D^{1/4} (24 - l_x)^{3/4} \\
\text{s.t.} & \quad py_D = wl_x \\
\end{align*}
\]

(Budget Constraint)

Note: We don’t have the term \( \pi_H \) here because firms retain all the profits and households only have one source of income: the labor income \( wl_x \).

2. Please write down the firm’s optimization problem. (Hint: Write down just one profit maximization equation and plug in the individual production function.)

The Firm’s optimization problem should be formulated like this:

\[
\begin{align*}
\text{Max} & \quad \pi = py_x - wI_D = pI_D^{2/3} - wl_x \\
\end{align*}
\]

(3) Denote the optimal level of labor supply for an individual household as \( l_x^* \) and optimal labor demand for an individual firm as \( I_D^* \) (both are functions of real wage rate). Denote the optimal level of bread demand for an individual household as \( y_D^* \) and optimal bread/output
supply from an individual firm as \( y_s^* \) (both are functions of real wage rate). Denote the profit of individual firm at optimal level of production as \( \pi^* \).

Write down the general forms of two market clearing equations. (Hint: don’t forget the number of households or firms in the economy!)

(1) The market clearing equation for the labor market is:
\[
5L_D^* = 30L_s^* \quad \text{(or, } L_D^* = L_s^* \text{)}
\]
(Note: We have 5 firms so we multiply individual firm’s labor demand by 5 to get aggregate labor demand; and we have 30 households so we multiply individual household’s labor supply by 30 to get aggregate labor supply.)

(2) The market clearing equation for the good market is:
\[
30y_D^* + 5 \frac{\pi^*}{p} = 5y_s^* \quad \text{(or, if you use aggregate representation, } Y_D^* + \frac{\Pi^*}{p} = Y_s^* \text{)}
\]
(Note: Again, be careful about the number of households and firms.)
Note: For part 3, you don’t need to plug in specific forms of optimal supply and demand functions since they are given to you in part 4 to actually solve for equilibrium real wage rate.

(4) Now suppose that price and money wages are fully flexible. If we have (take as given):
\[
l_s^* = 6 \\
L_D^* = \left( \frac{2p}{3w} \right)^3 \\
y_s^* = \left( \frac{2p}{3w} \right)^2 \\
y_D^* = \frac{6w}{p}
\]
Please solve out the equilibrium real wage rate \( \left( \frac{w^*}{p^*} \right) \) by using the equilibrium conditions you derive in part (3). (Hint: treat \( \frac{w}{p} \) as one variable, say, \( x \), to solve for it.) Note: you may leave the fraction of power unsolved, such as \( 10^{-1/4} \), \( 24^{-2/5} \), \( \frac{7}{3} \), etc.

The two equilibrium equations in part 3 are:
\[
(1) \quad 5L_D^* = 30L_s^* \\
(2) \quad 30y_D^* + 5 \frac{\pi^*}{p} = 5y_s^*
\]
Plug in the functional forms given in this part, the two equations become:
\[
(1) \quad 5 \left( \frac{2p}{3w} \right)^3 = 30 \times 6 \\
(2) \quad 30 \times 6 \frac{w}{p} + 5 \frac{\pi^*}{p} = 5 \left( \frac{2p}{3w} \right)^2
\]
Now if you use equation 1 (the labor market clearing condition), you can solve for \( \frac{w^*}{p^*} \) by the following steps:

\[
5 \left( \frac{2P}{3w} \right)^3 = 30 \times 6 \\
\iff \left( \frac{2P}{3w} \right)^3 = 36 \\
\iff \left[ \frac{2P}{3w} \right]^{1/3} = 36^{1/3} \\
\iff \frac{2P}{3w} = 36^{1/3} \\
\iff \frac{p}{w} = \frac{3}{2} \times 36^{1/3} \\
\iff \frac{w}{p} = \frac{2}{3} \times 36^{1/3}
\]

And this \( \frac{w}{p} \) is just the equilibrium real wage rate, \( \frac{w^*}{p^*} \) we want to find.

5. The Simple Keynesian Model of Fixed Prices

**Model Setting:** suppose the autonomous planned consumption expenditure for the economy is 20, the marginal propensity of consumption is 0.8, lump-sum tax is 5, the income tax rate (marginal propensity of taxation) is 0.1, government transfer is 10, investment level is 55, government expenditure is 20, aggregate export is 15, and marginal propensity to import is 0.2. All quantities (except marginal propensities) are measured in terms of units of the single good (say, bread) produced in this economy.

(1) Express aggregate planned expenditure as a function of the real GDP (or, aggregate income): \( AE = f(Y) \). Note: please plug in the numbers and simplify your result.

**First rephrase the conditions by using the notations we learned in class:**

\( a = 20, b = 0.8, T = 5, t = 0.1, \tau = 10, I = 55, G = 20, X = 15, m = 0.2 \).

**Then,**

\[
AE = C + I + G + X - M \\
= a + \beta Y + I + G + X - mY \\
= a - bT + b\tau + b(1-t)Y + I + G + X - mY \\
= a - bT + b\tau + I + G + X + [b(1-t) - m]Y \\
= 20 - 0.8 \times 5 + 0.8 \times 10 + 55 + 20 + 15 + [0.8(1 - 0.1) - 0.2]Y \\
= 114 + 0.52Y
\]
(2) By equating the demand side (AE) to the supply side (Y), solve for the equilibrium level of RGDP, \( Y^* \), which matches demand and supply. (You should be able to get a number)

**Solving like this:**
\[
114 + 0.52Y = Y \\
\Rightarrow (1 - 0.52)Y = 114 \\
\Rightarrow Y^* = \frac{114}{1 - 0.52} = 237.5
\]

(3) Suppose the government decrease the marginal rate of taxation (income tax rate) from 0.1 to 0.05, show the change of AE curve on a Keynesian Cross Diagram. (Hint: will the curve shift up or down parallel, or shift while anchored to the vertical-axis intercept point?)

**Note:** since the marginal rate of taxation only affects the slope but not the intercept of the AE curve, the curve should shift counter-clockwise while anchored to the intercept of vertical axis:

(4) Calculate the expenditure multiplier for this economy. Explain what it means.

**Expenditure Multiplier =**
\[
\frac{1}{1 - \beta + m} = \frac{1}{1 - b(1-t) + m} = \frac{1}{1 - 0.8(1-0.1) + 0.2} = \frac{1}{0.48} \approx 2.08
\]

It means that for every unit of increase in autonomous expenditure, the equilibrium expenditure in the economy will increase by approximately 2.08 units.

(5) Now if the government decides to increase its lump sum tax by 10 (which means the lump sum tax now is 15 rather than 5), what will the new equilibrium RGDP be? (holding everything same as in original model setting)

(Hint: first calculate the change in autonomous expenditure, \( \Delta A \), then use the expenditure multiplier to get the change in equilibrium RGDP, \( \Delta Y^* \). Lastly add the level of \( Y^* \) you got from part (2) to the change of equilibrium RGDP to get answer.)

Since \( A = a - bT + b\tau + I + G + X \), the change in \( A \) is the same as the change in \( T \) times negative of MPC, i.e. \( \Delta A = -b\Delta T = -0.8\times(10) = -8. \ Therefore,
\[
\Delta Y^* = \Delta A \frac{1}{1 - \beta + m} = (-8)\times2.08 = -16.64
\]

And the new equilibrium expenditure is \( Y^* + \Delta Y^* = 237.5 - 16.64 = 220.86 \)
(6) If the government were to raise lump sum taxes by 10 (like in part (5)) and also to increase its purchase by 10, will the equilibrium expenditure change? (Just write down “yes” or “no”, and briefly state your reasons. No need to carry out calculations!)

Yes. The “tax multiplier” is not as effective as the “government spending multiplier” in changing equilibrium expenditure because of positive marginal propensity to save.

(7) Use the Keynesian cross diagram and the AD-AS graph to illustrate a full crowding out effect for the very long run time interval. (Hint: You only need to focus on the long run aggregate supply curve and assume an increase in government expenditure.)

(You don’t need to draw SAS curves to get full credit.)