Question 1. (8 points) Adam Smith once said that "market mechanism is like *an invisible hand* that sends resources to the uses in which they have the highest values". Consider the apple market in Taiwan and suppose that the current market price is higher than the equilibrium price. Explain *in details* how this invisible hand adjusts apple market toward equilibrium (in words and a graph). Be sure that you apply the laws of supply and demand.

Question 2. (25 points) Suppose that one consumer has the following utility function:

$$u(x,y) = x^{\frac{1}{2}} y^{\frac{1}{2}}.$$

where x and y are two goods. Denote by p_x and p_y the prices of x and y, respectively.

(a) (4%) At the optimal choice, the consumer selects the consumption bundle (x, y) such that

$$MRS_{x,y} = \frac{p_x}{p_y}.$$

($MRS_{x,y}$ is marginal rate of substitution of x to y). What are the graphical and economic meaning of this equation?

(b) (4%) Suppose that the price of x is 10, the price of y is 10 and the consumer's income is 100. What are the optimal consumption bundle, denoted by (x_1^*, y_1^*) and the consumer's maximum utility level achieved?

(c) (3%) Find the optimal consumption bundle (x_2^*, y_2^*) when the price of x drops to 5.

(d) (8%) Find the compensated bundle (x_H^*, y_H^*) and the compensated income (M_H). Write down the compensated budget line (BL_H).

(e) (2%) Find the changes in demand of x due to the substitution effect and income effect.

(f) (4%) In a single big picture, graph the following:
   (*i*) Original budget line and optimal bundle (x_1^*, y_1^*).
   (*ii*) New budget line and optimal bundle (x_2^*, y_2^*).
   (*iii*) Compensated budget line and compensated bundle (x_H^*, y_H^*).
   (*iv*) Substitution effect and income effect.

Question 3. (20 points) A monopolist faces a market demand given by $Q = 40 - p$, where Q and p are the market output and price, respectively. The firm has a cost of

$$TC(Q) = Q^2 + 8Q.$$

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Question 6. (12 points) Zipperland produces only two goods: oranges and video games. The quantities and these goods produced and their prices in 1996 and 1997 are:

Good	1996 quantity	1996 price	1997 quantity	1997 price
Oranges	50	$1.00	45	$2.00
Video games	5	$10.00	7	$8.00

Let 1996 be the base year. Calculate the following:

(a) (2%) Zipperland's nominal GDP in 1996 and 1997.

(b) (6%) The chain-weighted output index in 1997 and the growth rate of real GDP in 1997.

(c) (4%) The GDP deflator in 1997 and the inflation rate in 1997.

Question 7. (10 points) In the economy of Zipperland, the marginal propensity to consume is 0.9, investment is $50 billion, government purchases of goods and services are $40 billion, and lump-sum taxes are $40 billion. Zipperland has no exports and no imports.

(a) (2%) What is the value of government purchases multiplier?

(b) (2%) The government cuts its purchases of goods and services to $30 billion. What is the change in equilibrium expenditure?

(c) (2%) What is the value of the lump-sum taxes multiplier?

(d) (2%) The government continues to purchase $40 billion worth of goods and services and cuts lump-sum taxes to $30 billion. What is the change in equilibrium expenditure?

(e) (2%) The government simultaneously cuts both its purchases of goods and services and lump-sum taxes to $30 billion. What is the change in equilibrium expenditure?