Question 1

Define the following four terms.

1) Substitutes and complements

Mankiw, p. 70. *Substitutes are two goods for which an increase in the price of one leads to an increase in the demand for the other. Complements are two goods for which an increase in the price of one leads to a decrease in the demand for the other.*

2) Comparative advantage

Mankiw, p. 53. *The ability to produce a good at a lower opportunity cost than another producer.*

3) Positive and normative economics

Mankiw, p. 28. *Positive statements are claims that attempt to describe the world as it is. Positive statements are claims that attempt to prescribe how the world should be.*

4) Income elasticity of demand

Mankiw, p. 97. *A measure of how much the quantity demanded of a good responds to a change in consumers’ income, computed as the percentage change in quantity demanded divided by the percentage change in income.*

Question 2

Two firms can produce the following goods in 15 minutes, as follows:

- Firm A: 1 belt; 2 wallets
- Firm B: 1 belt; 1 wallet

1) Who has the absolute advantage in belts? In wallets? Under these circumstances, can these firms both gain from trade? Why or why not?

*Firm A has the absolute advantage in wallets, as they can make two times the wallets as...*
Firm B over the same amount of time. No firm has the absolute advantage in belts (1 = 1). The firms can gain from trade. Firm A has the comparative advantage in wallets, as its opportunity cost for 1 wallet is ½ belt, while Firm B’s opportunity cost for 1 wallet is 1 belt. Firm B, therefore, has the comparative advantage in belts.

2) Now imagine that Firm B doubles its ability to create wallets. Under these new circumstances, who has the comparative advantage in belts? In wallets? Justify your answers.

*If firm B can now produce 2 wallets per 15 minutes, the two firms have the same opportunity costs for both goods, so there are no gains from trade.*

3) Using the PPF model, show the gains from trade under these new circumstances (if any). Illustrate carefully on two graphs the production and consumption possibilities for each firm.

*As there are no gains from trade, a correct answer just shows identical PPF’s with the same intercepts and slopes. For example, if one looks at production per hour, the intercept of one axis would be 4 belts, and the intercept on the other axis would be 8 wallets, with a slope of ½ or 2.*

4) If Firm A sees a large increase of demand for belts, how will your model above change (if at all)? Justify your answer.

*A correct answer notes that the PPF is not changed by demand. I will give you full credit if you careful explain how the PPF could shift out under these circumstances: an increase in inputs by the firm (e.g., more labor and capital) in response to the increase in demand.*

**Question 3**

Production and consumption of maple syrup - a delicious sweetener that comes from the sap of maple trees - are very common in Vermont. It is produced in the early spring (“mud season”) from full grown trees and consumed year-round.

Imagine that the demand and supply for pints of syrup among three suppliers and three consumers are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Consumer A</th>
<th>Consumer B</th>
<th>Consumer C</th>
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</thead>
<tbody>
<tr>
<td>$10</td>
<td>35</td>
<td>30</td>
<td>40</td>
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<td>$20</td>
<td>30</td>
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<td>$40</td>
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<tr>
<td>$50</td>
<td>10</td>
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<td>20</td>
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<tr>
<td>Price</td>
<td>Market demand</td>
<td>Market supply</td>
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<td>$10</td>
<td>105</td>
<td>0</td>
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<td>$20</td>
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<td>5</td>
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<td>5</td>
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<tr>
<td>$80</td>
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<td>85</td>
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</tbody>
</table>

b) Based on these data, what is the market demand schedule for maple syrup? What is the market supply schedule?

Adding up demand and supply, one would get:

b) What is the elasticity of market demand in the range between $20 and $30? What is the elasticity of market supply in the range between $20 and $30? Is demand in this range elastic or inelastic? What is the sign of the elasticity of supply?

Using the elasticity formula, elasticity of demand:
Absolute value of:

\[
\frac{(Q2 - Q1)}{(Average \ of \ Q1, \ Q2)} = \frac{(P2 - P1)}{(Average \ of \ P1, \ P2)}\\
\]

\[
\frac{(60 - 90)}{75} = \frac{(30 - 20)}{25}\\
-\frac{30}{75} \cdot \frac{25}{10} = -\frac{3}{3} = 1 \text{ (with absolute value)}\] This is unitary elasticity.

Using the elasticity formula, elasticity of supply:

\[
\frac{(Q2 - Q1)}{(Average \ of \ Q1, \ Q2)} = \frac{(P2 - P1)}{(Average \ of \ P1, \ P2)}\\
\]

\[
\frac{(15 - 5)}{10} = \frac{(30 - 20)}{25}\\
= \frac{5}{2}
\]

The elasticity of supply is always positive.

c) In January 2014, researchers at the Proctor Maple Research Center at the University of Vermont announced the discovery of a new technique that extracts the sap out of maple saplings. The new technique “would allow more maple syrup to be produced on less land.” Using a graphical model, show how this discovery is likely to affect the supply of maple syrup. How is the price of maple syrup likely to change in the short-run and the long-run as a result of this new technique? Is this change likely to increase revenues for producers? Justify your answers.

A good answer will show, graphically, that in the long run, the supply curve will shift out, but in the short run there will not be a large change (as suppliers begin to take on the new technology). The change in revenue will depend on the relative elasticities: if demand if relatively inelastic, this could mean less revenues, as we studied in the elasticities chapter.

Question 4

Imagine that you are an economic advisor to Vermont Governor Peter Shumlin. He tasks you
with following challenge:

- Design a consumption tax on one item of food to raise $10,000,000 in revenue.
- Make sure that the tax does not disproportionately hurt lower income nor older people.

As you are considering options for this tax, what kind of data would you need to collect to decide what food product to tax? How would those data help you to design the tax? Justify your answers, and use a graphic model to illustrate your answer.

A good answer will show that you would need data to be able to know the demand and supply elasticities of a set of possible goods (e.g., milk, corn, soda, etc.) for different demographics of people. Graphically, you should show the tax incidence and how it will depend on these elasticities. The best answers also mentioned income elasticities and labor supply elasticities (that is, determining if lower income or older people might be harmed by supply-side effects).