After re-reading Chapter 4 in Mankiw, answer the following:

1. Explain why there is usually a direct relationship between quantity supplied and price.

2. List the shift variables of supply.
   - Cost conditions, availability, expectations and number of sellers.

3. a. Show an increase in supply on a graph.
   b. Show a decrease in supply on a graph.

4. Using a separate graph for each, show the effects of the following on the supply of autos:
   a. Decrease in the price of steel
      - A decrease in input prices increases supply, figure 3a.
   b. Increase in wages of auto workers
      - An increase in input prices decreases supply, figure 3b.
   c. A foreign automaker enters the domestic market
      - An increase in the number of sellers increases supply, figure 3a.
   d. Government mandates that automakers install catalytic converters to reduce auto emissions
      - Increases in the cost of making an auto decreases supply, figure 3b.

5. a. Draw a graph of a market for gasoline with an equilibrium price of $1.95 a gallon. Note: a market requires both a supply schedule and a demand schedule.
b. On a separate graph for each, show the effects of each of the following on price and quantity exchanged:

1. Increase in demand (Price increases, Quantity increases)

\[ P \quad P' \quad S \quad S' \]
\[ $3.49 \]
\[ Q' \quad Q \]

2. Decrease in demand (Price decreases, quantity decreases)

\[ P \quad P' \quad S \quad S' \]
\[ $3.49 \]
\[ Q' \quad Q \]

3. Increase in supply (Price decreases, quantity increases)

\[ P \quad P' \quad S \quad S' \]
\[ $3.49 \]
\[ Q' \quad Q \]

4. Decrease in supply (Price increases, quantity decreases)

\[ P \quad P' \quad S \quad S' \]
\[ $3.49 \]
\[ Q' \quad Q \]

6. Using a separate graph for each case, show the effects of each of the following changes on the market for autos. As part of your analysis, state the shift variable for each.

a. Increase in the price of gas
   Increase in the price of a complement decreases demand, lowering both price and quantity. Figure 5.b.2

b. A recession reduces average incomes
   A reduction in incomes decreases demand, assuming autos are a normal good, lowering
both price and quantity. Figure 5.b.2

c. Increase in the price of steel
   An increase in costs (input prices) decreases supply raising price and lowering quantity. Figure 5.b.4
d. Auto makers install robots on assembly lines
   Lowering costs (a technological improvement) increases supply, lowering price and quantity. Figure 5.b.3

7. Compare and contrast complementary goods with inputs: define each term, state the side of the market each affects, and give an example of each.
   Complementary goods are pairs of goods consumed together, such as gasoline and automobiles, or computers and software. A change in the price of a complement affects the demand side of the market: a fall in the price of a complement causes the demand for the other to rise.

   Inputs are used in the production process of some other good. Examples are steel for automobiles and silicon for computer chips. Inputs affect the supply side: an increase in an input price makes it more expensive to produce any given quantity of a good, so the supply decreases.

8. In terms of our shift variables of demand and supply, how are each of the following pairs related?
   a. Wheat and bread (wheat is an input, a cost of producing bread)
   b. Butter and bread (these are complements)
   c. Peanuts and peanut butter (peanuts are an input, a cost of producing peanut butter)
   d. Crackers and peanut butter (complements)
   e. Cotton and dress shirts (cotton is an input, a cost of producing shirts)
   f. Neckties and dress shirts (complements)
   g. Leather and shoes (leather is an input, a cost of producing shoes)
   h. Socks and shoes (complements)

9. Explicitly show the effects of each of the following changes on the price and quantity exchanged in the market indicated.

<table>
<thead>
<tr>
<th>Market</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Bread</td>
<td>Price of wheat falls</td>
</tr>
<tr>
<td>↑Supply of Bread, ↓P, ↑Q</td>
<td>(Input)</td>
</tr>
<tr>
<td>b. Bread</td>
<td>Price of butter falls</td>
</tr>
<tr>
<td>↑Demand for Bread, ↑P, ↑Q</td>
<td>(Complement)</td>
</tr>
<tr>
<td>c. Peanut butter</td>
<td>Price of peanuts rises</td>
</tr>
<tr>
<td>↓S of PB, ↑P, ↓Q</td>
<td>(Input)</td>
</tr>
<tr>
<td>d. Peanut butter</td>
<td>Price of jelly rises</td>
</tr>
<tr>
<td>↓D for PB (complement), ↓P, ↓Q</td>
<td>(Complement)</td>
</tr>
<tr>
<td>e. Neckties</td>
<td>Price of silk rises</td>
</tr>
<tr>
<td>↓S of Ties, ↑P, ↓Q</td>
<td>(Input)</td>
</tr>
<tr>
<td>f. Dress shirts</td>
<td>Price of cotton rises</td>
</tr>
<tr>
<td>↓S of Ties, ↑P, ↓Q</td>
<td>(Input)</td>
</tr>
</tbody>
</table>
10. Compare and contrast *income of consumers* with *wages* of a particular group of workers: define each term, state the side of the market that each affects, and give an example of each.  

*Wages of a particular group of workers (autoworkers, for example) are only part of consumer income. Income determines what consumers can purchase and affects the demand side of the economy. Wages are a cost that businesses must bear to produce goods and services and affect the supply curve.*

11. Explicitly show the effects of the following changes on the **price and quantity exchanged** in the market indicated:

<table>
<thead>
<tr>
<th>Market</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Lobster</td>
<td>Increase in wages for lobstersmen</td>
</tr>
<tr>
<td></td>
<td>Increase in cost conditions</td>
</tr>
<tr>
<td></td>
<td>↓S of Lobster, ↑P, ↓Q</td>
</tr>
<tr>
<td>b. Lobster</td>
<td>Average income in the US rises</td>
</tr>
<tr>
<td></td>
<td>Incomes of consumers rise</td>
</tr>
<tr>
<td></td>
<td>↑Demand for Lobster (if normal), ↑P, ↑Q</td>
</tr>
<tr>
<td>c. Cars</td>
<td>A recession with high unemployment occurs</td>
</tr>
<tr>
<td></td>
<td>Incomes of consumers fall</td>
</tr>
<tr>
<td></td>
<td>↓D for Cars, ↓P, ↓Q</td>
</tr>
<tr>
<td>d. Cars</td>
<td>Auto workers bargain for and receive higher wages</td>
</tr>
<tr>
<td></td>
<td>Increase in cost conditions</td>
</tr>
<tr>
<td></td>
<td>↓S of Cars, ↑P, ↓Q</td>
</tr>
</tbody>
</table>

12. Show the effects of each of the following changes on the **market for pizza**. State the shift variable and explicitly show the changes in **price and quantity exchanged**.

a. Increase in the price of beer  
   **Complement, decrease D for pizza**

b. Decrease in the price of fast food hamburgers  
   **Substitutes, decrease D for pizza**

c. Increase in the price of cheese  
   **Costs (input price), decrease S of pizza**

d. A genetically engineered tomato is developed and produced  
   **Costs (input price falls), increase S of pizza**

13. Click the Article Link under HW3 and read “The Role of Prices” by Walter Williams, then answer the following questions:

a. Pick a market Williams mentions and show the effects of Hurricane Katrina on a graph of that market.  
   **Answers will vary. Williams mentions retail stores, housing, gasoline, hotel rooms. Depending on how the market is defined, there could be either a decrease in supply (stores, housing, gasoline) or an increase in demand (e.g., hotels in Baton Rouge).**

b. “Rising prices get people to voluntarily economize on goods and services rendered scarcer by the disaster.” Explain and give an example.  
   **Williams’ example: a family of four is likely to opt for one room at $200, rather than two rooms at $79. Such economizing in response to the price increase frees up a room for another family.**