Project 2: The Price of Gasoline

This project is an opportunity to demonstrate your best effort in interpreting and communicating mathematics.

This project is due on Thursday, January 10, the date of the final exam.

Project Tips:

The best way to organize the work you submit is by restating each project question along with the question number and then answering the question as fully as you can using complete sentences in neat handwriting. You should also include the data in your answers. For some questions, you may want to select and graph certain data points to support your answer.

Academic Integrity Statement:

You are encouraged to discuss this project with some of your classmates. Feel free during this time to help each other read the graphs and understand the questions. When it comes to submitting this project for an individual grade, your written answers should be your own. You cannot copy the exact sentences that another student has written as an answer to a question and represent this as your own work.

You have undoubtedly heard the words "supply and demand" used to explain why the prices of various items (cars, iPods, airline tickets) seem to have increased by a huge amount whenever you want to buy them. This project looks at the price of oil (and, therefore, gasoline) to show you how this all works.

Economists like to talk about 2 kinds of mathematical relationships: the demand curve and the supply curve ("curve" may be linear). Simply stated, the demand curve is a mathematical or graphical way of expressing the factthat as the price of a product increases, the demand (or amount sold) of that product decreases.

The supply curve concept is a little different. What it states is that as the price of a product increases, the supply (or amount that people are willing to sell) increases. Think of a product like wheat. If the price of wheat is low, many farmers will decide not to grow it because it costs them more in seed and labor than they can get for it and the supply will fall. On the other hand, if the price of wheat is high, then farmers will grow more and, perhaps, farmers who never grew wheat before will decide to grow it because there's now a lot of money in growing wheat and the supply will increase.

Instead of talking about wheat, let's talk about oil for this project. Oil is subject to the same supply and demand concepts. As the price of oil (and, therefore, gasoline) increases, the amount bought will decrease. People will drive less, set their thermostats lower, etc. Similarly, as the price of oil increases, the supply will increase. Oil wells that were not producing enough to make a profit will be reactivated at higher prices; turning coal into oil will become attractive; pumping more oil from existing wells will look better and better to oil producers.

Let's look at a hypothetical (but not so far off) demand for oil worldwide.

Price of Oil per Barrel ($)	Millions of Barrels per Day (Mbpd) Used
40	**84.0**
50	**82.0**
60	**80.0**
70	**78.0**
80	**76.0**

And let's looks at the supply of oil as a function of price.

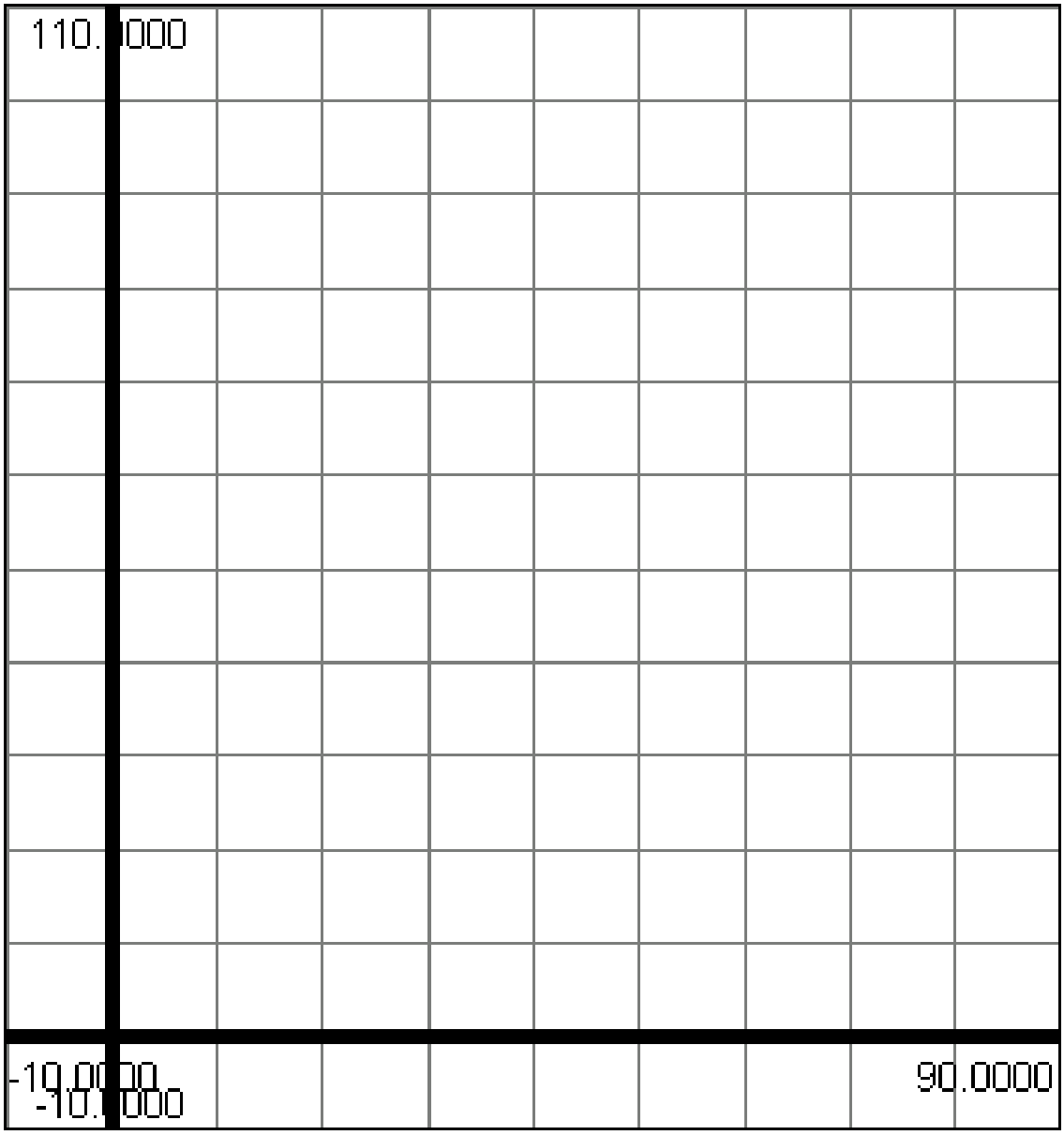
Price of Oil per Barrel ($)	Millions of Barrels per Day (Mbpd) Produced
40	**70.0**
50	**77.5**
60	**85.0**
70	**92.5**
80	**100.0**

1. a. Develop an equation for the demand for oil as a function of price.

b. What is the demand for oil if the price is $10?

2. Develop an equation for the supply of oil as a function of price.

3. Graph both of these equations on graph paper (attached). Plot Price on the x-axis and Quantity Used/Produced on the y-axis. Label the axes. Remember you can plot two data points from the table and use a ruler or something with a straight edge to draw the line. Label the lines D_1 and S_1.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Economists describe an equilibrium point (the point at which prices are stable) as the point where the price and quantity of product are the same for the demand curve and the supply curve. In other words, the quantity demanded equals the quantity supplied. This is the point of intersection of both curves and is computed by the solving of the system of equations for supply and demand.

4. a. Find this equilibrium point by solving the system of equations for supply and demand. What is the equilibrium price, the equilibrium quantity (supply and demand) of oil? (Round all answers to 2 decimal places)

b. On your graph, to the left of the equilibrium price, which is greater: supply or demand?

Why?

On your graph, to the right of the equilibrium price, which is greater?

Why?

Suppose that the supply of oil is reduced approximately 10% due to an interruption in supply caused by Hurricane Katrina. The table below is the new supply relationship.

Price of Oil per Barrel ($)	Millions of Barrels per Day (Mbpd) Produced
40	**62.0**
50	**69.5**
60	**77.0**
70	**84.5**
80	**92.0**

5. Develop the new equation for Supply. Graph the new supply equation on the same graph as before using a different color pen or dashed line.

6. a. Solve for the new equilibrium price and quantity (Round all answers to 2 decimal places).

b. Compare to the answers to question 4.
After Hurricane Katrina, the price of oil _____ and the demand _____.

c.. By what percentage has the price increased due to this approximately 10% reduction in supply?

Suppose that at the same time as Katrina hit, the worldwide demand for oil increases by approximately 10%. This is shown on the table below and could result from an increase in demand from developing countries such as India and China.

Price of Oil per Barrel ($)	Millions of Barrels per Day (Mbpd) Used
40	**92.0**
50	**90.0**
60	**88.0**
70	**86.0**
80	**84.0**

7. Develop the new equation for demand and graph the equation on the same graphusing a second color or dashed line.

8. Solve for the new equilibrium price and quantity resulting from both Hurricane Katrina and this increase in demand (Round all answers to 2 decimal places). For this approximately 10% increase in demand and 10% decrease in supply, by what percentage has the price of a barrel of oil increased compared to the price before Katrina and increased demand?