1. The company you manage has already invested $400,000 in developing a new product, but the development is not quite finished. At a recent meeting, your salesperson reports that the introduction of competing products has reduced the expected sales of your new product to $250,000.
   a. If it would cost $300,000 to finish development and make the product, should you go ahead and do so? Clearly explain. (5 points)

   No. Recall from Chapter #1 that "rational people think on the margin." Therefore, you would want to finish the development of the product if and only if the "marginal benefits" are greater than the "marginal costs." From the given information, $MB = 250,000 < 300,000 = MC$. Since "marginal cost" are greater than "marginal benefits," you should not complete the development of the product.

   b. What is the largest dollar amount that you should be willing to pay to complete the development of the product? Clearly explain. (5 points)

   Since $MB = 250,000$ it follows that $MB > MC$ so long as $MC < 250,000$. Therefore, you should be willing to pay any amount up to $250,000 to complete the development of the product.

2. Imagine a society that produces military goods ("guns") and consumer goods ("butter"). The Production Possibilities Frontier for guns and butter is illustrated below.
a. In the figure above, identify a point which is impossible for this economy to achieve (label this point “U”). In the figure above, identify a point which can be achieved, but is inefficient (label this point “I”). (4 points)
b. Suppose the society has two political parties, the Hawks (that want a strong military, but still some consumer goods) and the Doves (that want a smaller military, and more consumer goods). In the figure above: identify a point that the Hawks might argue in favor of (label this point “H”); identify a point that the Doves might argue in favor of (label this point “D”). (4 points)
c. Suppose that an aggressive neighboring country reduces the size of its military. As a result, both Hawks and Doves reduce their desired level of Guns by the same amount. Which party would realize a bigger “peace dividend,” measured by the resulting increase in butter production. Clearly Explain. (4 points)

3. Gene and Emmanuel devote each workday to producing either “computers” or “pizza.” On any given day Gene can produce either 10 computers or 20 pizzas, while Emmanuel can produce either 40 computers or 20 pizzas. As a result, the opportunity cost of pizza for Gene is $OC_{Pizza}^{Gene} = .5$, while the opportunity cost of pizza for Emmanuel is $OC_{Pizza}^{Emmanuel} = 2$. Suppose that trade can take place between these two workers.
   a. Determine the maximum number of computers that these two individuals can produce collectively. (4 points)
   
   \[10 + 40 = 50\]

   b. Which of these two individuals has a comparative advantage in the production of computers? Explain. (4 points)

   Recalling that $OC_{Computers}^i = \frac{1}{OC_{Pizza}^i}$ for each individual, we have $OC_{Computers}^{Gene} = 2$

   and $OC_{Computers}^{Emmanuel} = .5$. Since $OC_{Computers}^{Emmanuel} < OC_{Computers}^{Gene}$, we see that Emmanuel has a comparative advantage in the production of computers.
c. Graph the daily Production Possibilities Frontier for this “two person economy.” Clearly label each intercept, as well as the slope of this curve at each point. (6 points)

\[ \text{Slope} = - \frac{OC_{\text{Gene}}}{\text{Pizza}} = -\frac{1}{2} \]

\[ \text{Slope} = - OC_{\text{Emmanuel}} = -2 \]

d. Argue that: “Without trading with one another, it is not possible for Gene to consume 10 computers and 10 pizzas and for Emmanuel to consume 30 computers and 10 pizzas. However, with trade these levels of consumption are possible.” (4 points)

In order to consume these levels with trade, the society would collectively have to produce \( C = 40 \) and \( P = 20 \). This can be done by having Emmanuel produce only computers and Gene produce only pizzas. However, without trade these levels of consumption are not possible. This is clear by noting that if Gene were to produce 10 computers, he is not able to produce any pizzas (so 10 computers and 10 pizzas is not feasible for Gene). Similarly, if Emmanuel were to produce 10 pizzas, he can produce no more than 20 computers (so 10 pizzas and 30 computers is not feasible for Emmanuel).
4. a. State the “Law of Demand.” (6 points)

The "Law of Demand" state that, holding all factors other than price constant, there is an inverse relation between price and quantity demanded. As a result, if price is increased, then quantity demanded must decrease. Equivalently, if price is decreased, then quantity demanded must increase. Visually, the demand curve must be "downward sloping."

b. If demand is given by the inverse function \( P_D(q) = \frac{2000}{q} \) is the Law of Demand satisfied? Clearly explain. (4 points)

For this inverse demand function, it is clear that if \( q \) is increased, the value of \( P_D(q) \) must decrease (since the numerator \([2,000]\) does not depend upon \( q \), while the denominator \([q]\) becomes larger as \( q \) is increased - therefore, the "entire fraction" must become "smaller" as \( q \) is increased).

5. Consider the market for apples. Suppose that between 2003 and 2004 supply increases while demand decreases. Clearly explain how the equilibrium price and quantity in 2004 compare to the equilibrium price and quantity in 2003. (12 points)

If demand decreases and supply increases simultaneously, the equilibrium price must decrease. However, it is not possible to specify the directional change of the equilibrium quantity. This is illustrated in the graph below.
6. Consider a market in which demand is given by \( D(p) = 100 - 4p \) and supply is given by \( S(p) = 6p \).
   a. Is there “excess demand,” “excess supply,” or neither at a price of \( p = 5 \)? Explain. (4 points)
   
   \( D(5) = 100 - 20 = 80 \), which is greater than \( S(5) = 30 \). Therefore, at a price of \( p = 5 \) there is "excess demand."

   b. Is there “excess demand,” “excess supply,” or neither at a price of \( p = 20 \)? Explain. (4 points)
   
   \( D(20) = 100 - 80 = 20 \), which is less than \( S(20) = 120 \). Therefore, at a price of \( p = 20 \) there is "excess supply."

   c. Determine the equilibrium price and equilibrium quantity in this market. (6 points)
   
   The equilibrium price is such that \( D(p) = S(p) \), or equivalently \( 100 - 4p = 6p \). From here we obtain \( p^* = 10 \), implying \( q^* = D(p^*) = S(p^*) = 60 \).

7. J.R. and Peter devote each workday to producing either “corn” or “beef.” On any given day J.R. can produce either 4 bushels of corn or 10 pounds of beef, while Peter can produce either 3 bushels of corn or \( B \) pounds of beef.
   a. Based upon the provided information, which individual has an absolute advantage in the production of corn? Explain. (4 points)
   
   J.R. has an absolute advantage in the production of corn, since in any given day he would be able to produce more corn than Peter (4>3).

   b. Based upon the provided information, which individual has an absolute advantage in the production of beef? Explain. (4 points)
   
   Without knowing the value of \( B \) we cannot determine which individual has an absolute advantage in the production of beef. For example: if \( B < 10 \), then J.R. has an absolute advantage in the production of beef; if instead \( B > 10 \), then Peter has an absolute advantage in the production of beef.
c. Specify a value of $B$ for which J.R. has a comparative advantage in the production of beef. Justify your answer. (6 points)

Start by noting that the opportunity cost of beef for J.R. is $OC^{J.R.}_{Beef} = \frac{4}{10} = \frac{2}{5}$. In terms of $B$, the opportunity cost of beef for Peter is $OC^{Peter}_{Beef} = \frac{3}{B}$. J.R. will have a comparative advantage in the production of beef so long as $OC^{J.R.}_{Beef} < OC^{Peter}_{Beef}$. This will be the case so long as $\frac{2}{5} < \frac{3}{B}$, or equivalently $B > \frac{15}{2} = 7.5$.

d. Specify a value of $B$ for which Peter has a comparative advantage in the production of beef. Justify your answer. (6 points)

From the answer in part (c) above, Peter will have a comparative advantage in the production of beef so long as $OC^{J.R.}_{Beef} > OC^{Peter}_{Beef}$. This will be the case so long as $\frac{2}{5} > \frac{3}{B}$, or equivalently $B > \frac{15}{2} = 7.5$.

e. In general, is it ever possible for J.R. to simultaneously have a comparative advantage in the production of both corn and beef? Clearly explain. (4 points)

No. Recall that in general it must be that $\frac{1}{OC^i_{Corn}} = OC^i_{Beef}$ for each individual. Now suppose that J.R. has a comparative advantage in the production of corn. In this case $OC^{J.R.}_{Corn} < OC^{Peter}_{Corn}$, implying $\frac{1}{OC^i_{Corn}} < \frac{1}{OC^{Peter}_{Corn}} < \frac{1}{OC^{J.R.}_{Corn}}$. From here, $OC^{Peter}_{Beef} < OC^{J.R.}_{Beef}$, implying that Peter has a comparative advantage in the production of beef.