

## Exam #3 (80 Points Total)

- Other than this cheat sheet (which you should tear off), all you are allowed to use for help are the basic functions on a calculator.
- The space provided below each question should be sufficient for your answer, but you can use additional paper if needed.
- *Show your work for partial credit.* It is very difficult to give partial credit if the only thing on your page is “ $x = 3$ ”.
- A **Pareto efficient** (or **Pareto optimal**) allocation or outcome is one in which it is not possible find a different allocation or outcome in which nobody is worse off and at least one person is better off. An allocation or outcome B is a **Pareto improvement over A** if nobody is worse off with B than with A and at least one person is better off.
- **Total revenue** is price times quantity:  $TR = pq$ .
- The **price elasticity of demand at point A** measures the percentage change in quantity demanded (relative to the quantity demanded at point A) resulting from a 1% increase in the price (relative to the price at point A). The formula is

$$\varepsilon(A) = \frac{\% \text{ change in } q}{\% \text{ change in } p} = \frac{\frac{\Delta q}{q_A}}{\frac{\Delta p}{p_A}} = \frac{\Delta q}{\Delta p} \cdot \frac{p_A}{q_A} = \frac{q_B - q_A}{p_B - p_A} \cdot \frac{p_A}{q_A}.$$

**In English** If, at point A, a small change in price causes the quantity demanded to increase by a lot, demand at point A is elastic; if quantity demanded only changes by a little then demand at point A is inelastic; and if quantity demanded changes by a proportional amount then demand at point A has unit elasticity.

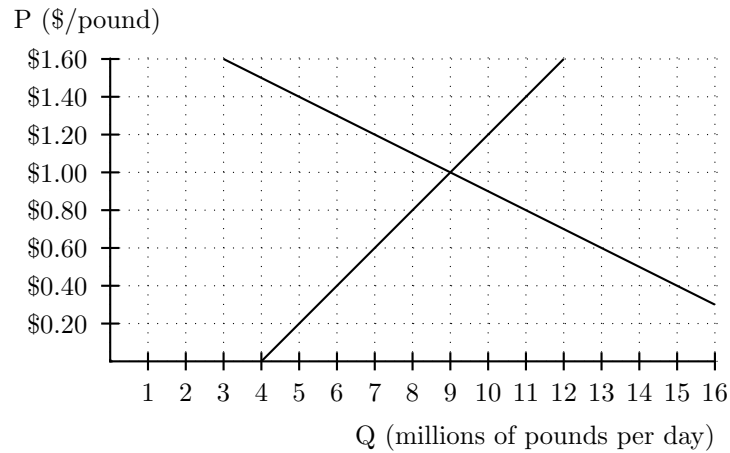
**In math** If, at point A, the price elasticity of demand is less than  $-1$  (e.g.,  $-2$ ), then demand at point A is elastic; if the elasticity is greater than  $-1$  (e.g.,  $-\frac{1}{2}$ ), then demand at point A is inelastic; if the elasticity is equal to  $-1$  then demand at point A has unit elasticity.



Name:

1. For each item, indicate the likely impact on the supply and demand for DVD players. Then indicate the effect on the equilibrium price and quantity. If you use a graph, all you need to have is labels on your axes and an arrow indicating which curve(s) shift which way.
  - (a) (5 points) Firms that sell and rent DVDs lower their prices. (Note that DVDs and DVD players are **complements**, like beans and corn-bread or computers and keyboards.
  
  
  
  
  
  
  
  
  
  
  - (b) (5 points) Apple follows up on the success of its iTunes Music Store with iMovies Store, a website that allows you to download movies from the internet.
  
  
  
  
  
  
  
  
  
  
  - (c) (5 points) The price of lasers (a key component in DVD players) increases.
  
  
  
  
  
  
  
  
  
  
2. (5 points) Explain, as if to a non-economist, why the intersection of the market supply curve and the market demand curve identifies the market equilibrium.

3. Below is a hypothetical market for oranges.



**Suppose that the government decides to impose a sales tax of 50% on the sellers of oranges.** (With a sales tax, if sellers sell a pound of oranges for \$1, they get to keep \$.50 and have to pay the government \$.50; if they sell a pound of oranges for \$2, they get to keep \$1 and have to pay the government \$1.)

- (a) (5 points) Show the impact of this tax on the supply and demand curves above.
- (b) (5 points) Explain (as if to a non-economist) why the tax shifts the curves the way it does.

- (c) (5 points) Calculate the economic incidence of the tax, i.e., the amount of the tax burden borne by the buyers ( $T_B$ ) and the amount borne by the sellers ( $T_S$ ). Then calculate their ratio  $\frac{T_B}{T_S}$ .

- (d) (5 points) Calculate the price elasticity of supply,  $\varepsilon_S$ , at the original (pre-tax) equilibrium. Then calculate the price elasticity of demand,  $\varepsilon_D$ , at the original (pre-tax) equilibrium. Then calculate their ratio,  $\frac{\varepsilon_S}{\varepsilon_D}$ . How does this ratio compare to the ratio of the tax burdens?

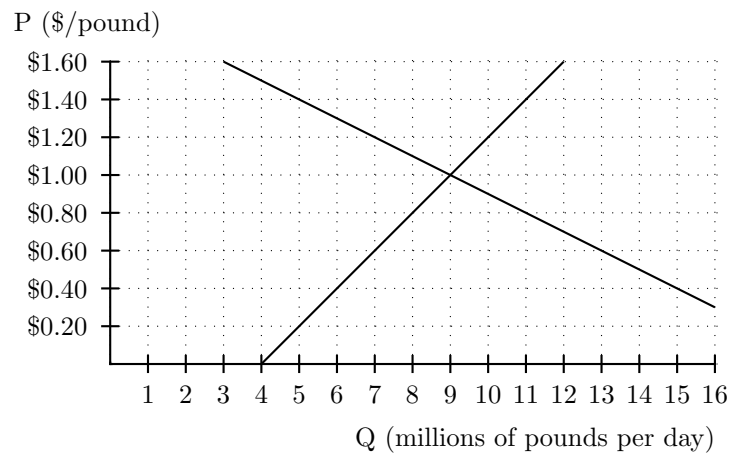
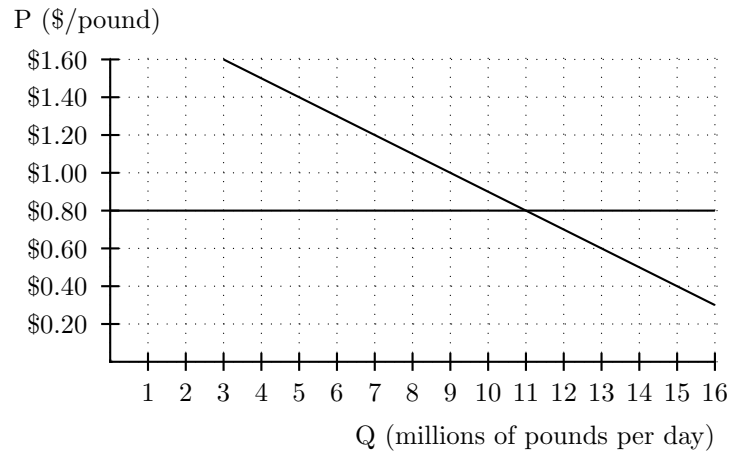


Figure 1: An extra graph in case you need it for anything...

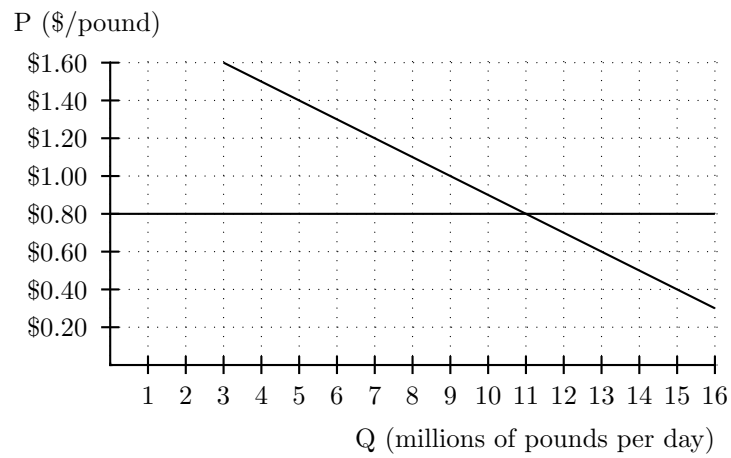
4. Below is a hypothetical market for oranges.



**Suppose that the government decides to impose a per-unit tax of \$0.40 per pound on the buyers of oranges.**

- (5 points) Show the impact of this tax on the supply and demand curves above.
  - (5 points) Explain (as if to a non-economist) why the tax shifts the curves the way it does.
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- (5 points) Calculate the economic incidence of the tax, i.e., the amount of the tax burden borne by the buyers ( $T_B$ ) and the amount borne by the sellers ( $T_S$ ).

- (d) (5 points) How would the economic incidence of the tax change if the \$0.40 per-unit tax was placed on the sellers instead of on the buyers? Use the graph below to analyze this situation, and briefly explain your answer.



5. (5 points) Consider a world with 100 buyers, each with an individual demand curve of  $q = 30 - 2p$ . There are also 200 sellers; 100 of them have an individual supply curve of  $q = 8p - 5$ , and 100 of them have an individual supply curve of  $q = 10p - 10$ . Determine the market demand curve and the market supply curve. *Circle your answers!*
6. Consider a world with market demand curve  $q = 115 - 10p$  and market supply curve  $q = 20p - 5$ .
- (a) (5 points) What is the market equilibrium price and quantity? *Circle your answer!*
- (b) (5 points) How would the equations for the supply and demand curves change if the government imposed a tax of \$.50 per unit on the sellers? (Note: You do *not* need to find the new equilibrium; just write down the equations for *both* supply and demand.)
- (c) (5 points) How would the equations for the supply and demand curves change if the government imposed a sales tax of 10% on the buyers? (Note: You do *not* need to find the new equilibrium; just write down the equations for *both* supply and demand.)