Homework Exercises 3: Elasticity

1. a. They should increase their price to \$40/hour. With a price elasticity of demand of 0.5 (inelastic), an increase in price will lead to a less-than-proportionate decrease in quantity demanded. This means total revenue will *increase* if the price is raised from \$30 to \$40.

   b. Demand is likely to become more elastic. The availability of substitutes is one of the primary determinants of price elasticity of demand. Increased competition from companies providing essentially the same service will make demand for "Three Guys" services more sensitive to changes in price, hence, more elastic.

2. a. For business travelers,

$$E_{D,p} = \frac{(1900 - 2000)/1950}{(250 - 200)/225} = \frac{-0.0513}{0.2222} = -0.23$$

   For vacationers,

$$E_{D,p} = \frac{(600 - 800)/700}{(250 - 200)/225} = \frac{-0.2857}{0.2222} = -1.29$$

   b. The price elasticity of demand for vacationers is higher than the elasticity for business travelers because vacationers are more flexible in travel plans. For example, they can choose a different mode of transportation, a different destination, or even not to travel at all. On the other hand, business travelers are less likely to do so because their travel plans and schedules are less adaptable. In some cases, some of the business travelers must travel regardless of price.

3. a. With a price elasticity of demand of 0.4, reducing the quantity demanded of cigarettes by 20% requires

$$\frac{-20\%}{\%\text{ change in } p} = -0.4$$

$$\%\text{ change in } p = 50\%$$

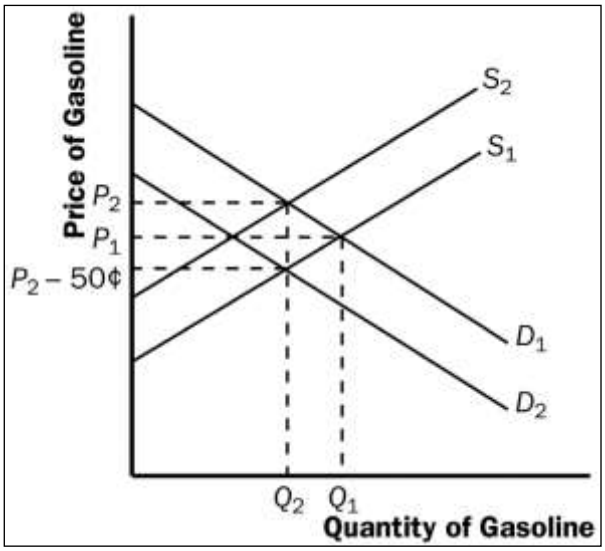
   So, price should rise by **50%** or $\$2 \times 50\% = \$\mathbf{3}$.

   It is also correct if you are using midpoint method, such that

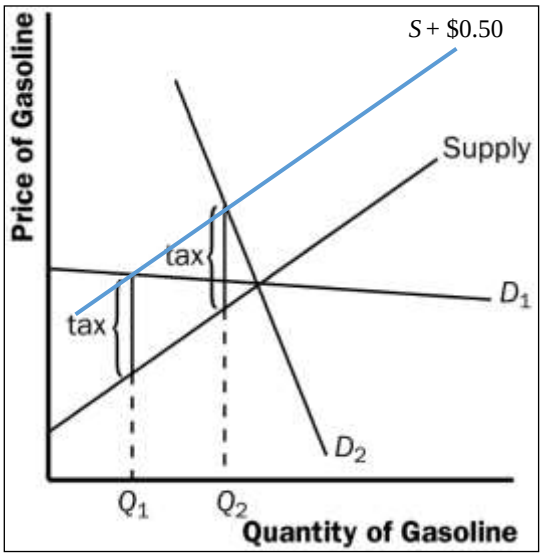
$$\frac{\$x - 2}{(\$x + 2)/2} = 50\%$$

$$\$x = \$\mathbf{3.33}$$

   b. Long-run elasticity of demand for cigarettes is higher because people have more time to adjust consumption habits (e.g. quit smoking) or find substitutes (e.g. e-cigarette), making demand more sensitive to price changes in the long run. In the short-run, when the price of cigarettes rises, smokers may decrease their cigarette consumption only slightly because smoking is addictive.



4. a. It does not matter whether the tax is imposed on producers or consumers, because the effect will be the same. With no tax, as shown in the above figure, the demand curve is D_1 and the supply curve is S_1. If the tax is imposed on producers, the supply curve shifts up by the amount of the tax (50 cents) to S_2. Then the equilibrium quantity is Q_2, the price paid by consumers is P_2, and the price received (after taxes are paid) by producers is $P_2 - 50$ cents. If the tax is instead imposed on consumers, the demand curve shifts down by the amount of the tax (50 cents) to D_2. The downward shift in the demand curve (when the tax is imposed on consumers) is exactly the same magnitude as the upward shift in the supply curve when the tax is imposed on producers. So again, the equilibrium quantity is Q_2, the price paid by consumers is P_2 (including the tax paid to the government), and the price received by producers is $P_2 - 50$ cents.

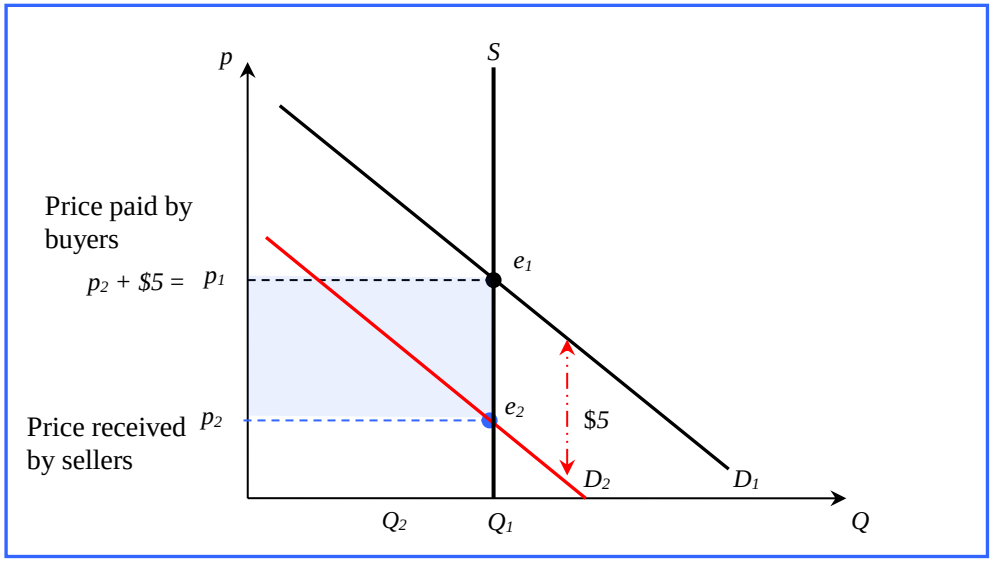


b. If demand is more elastic, consumers reduce quantity more in response to price increases, so the tax is more effective in reducing the quantity of gasoline consumed. The above figure illustrates this result. Demand curve D_1 represents a more elastic demand curve, while demand curve D_2 is less elastic. The tax will cause a greater decline in the quantity sold when demand is more elastic.

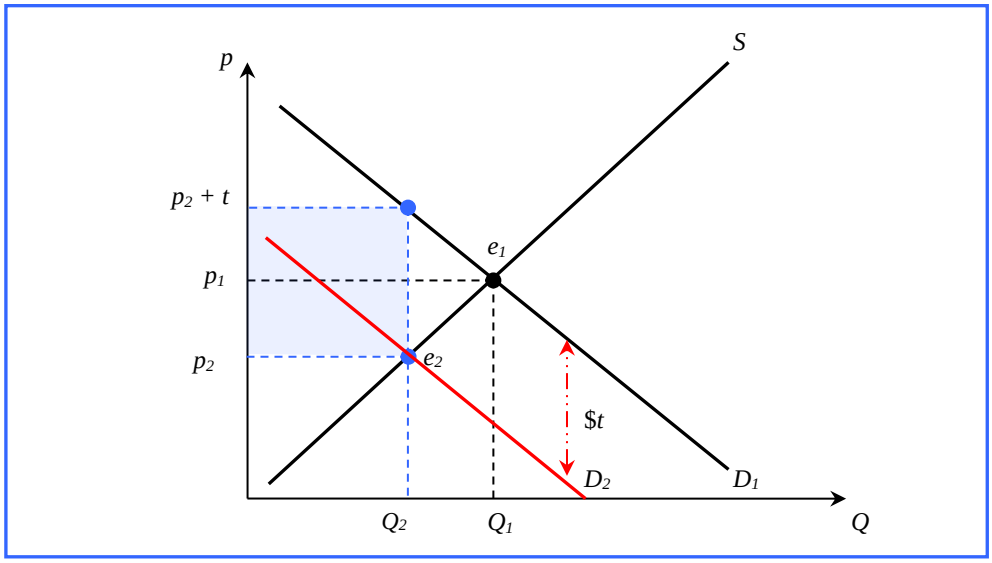
5. Tom always buys 10 gallons, regardless of price. So, his demand is *perfectly inelastic demand* (elasticity = 0).

   Jerry always spends \$10, so if price rises, he buys fewer gallons, because $p \times Q = \$10$ always. As the revenue received by the gas station will not change, regardless of price changes. It implies that his percentage change in quantity always equal to the percentage change in price. So, his demand is *unit elastic* (elasticity = -1).

6. As the quantity of tickets supplied is fixed, the supply of tickets is perfectly inelastic. In this case, the entire burden of the tax will fall on the sellers (the owners). The following figure shows that the price received by the sellers will fall by exactly \$5. On the other hand, after tax, the fans still pay the same price as before.

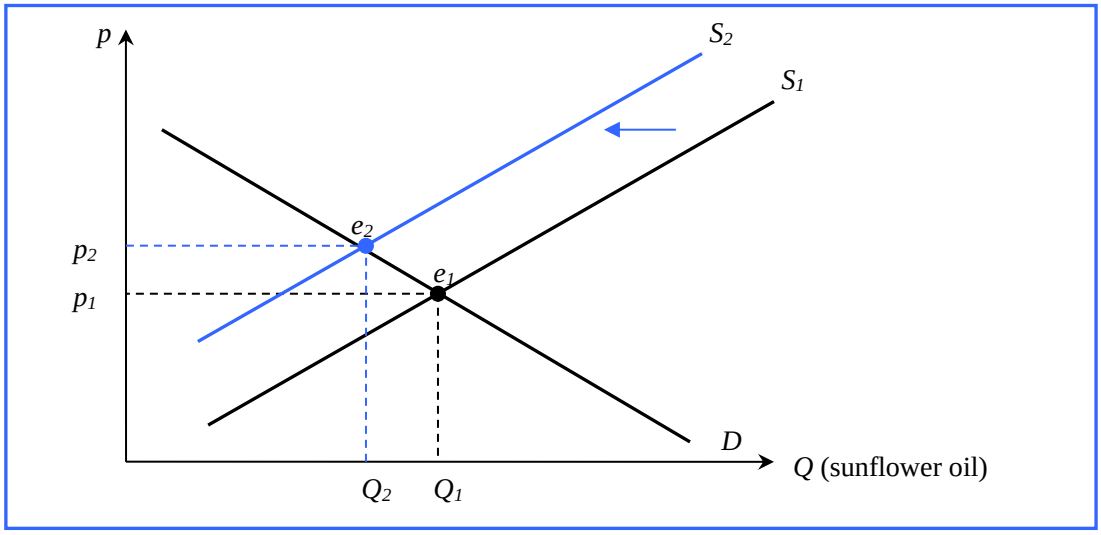


7. a. When the government collects a tax of \$$t$ from buyers, it shifts the demand curve downward by \$$t$ from D_1 to D_2. The market equilibrium changes from e_1 to e_2. Therefore, the equilibrium price would decrease from p_1 to p_2 and the equilibrium quantity decreases from Q_1 to Q_2. With tax, the sellers receive less per unit. However, the consumers pay more per unit (after tax), i.e. $p_2 + t$. The local government will receive the total amount of $t \times Q_2$.



b. The cross-price elasticity of demand gasoline car with respect to the price of BEVs is 0.19. When the price of BEVs increases by 1%, the demand for gasoline cars will increase slightly by 0.19%, implying that BEVs and gasoline cars are substitutes (but not close). So, if a tax is imposed on BEVs, the quantity demanded for BEVs will drop and the demand for gasoline cars will increase slightly. Therefore, the proposed sales tax does not align with the Norwegian government's goal to eliminate gasoline cars – this choice highlights an important tradeoff facing the policymakers.

8. a. The war reduces the supply of sunflower oil, shifting the supply curve leftward. As a result, the equilibrium price of sunflower oil will rise from p_1 to p_2 and the equilibrium quantity will decrease from Q_1 to Q_2.

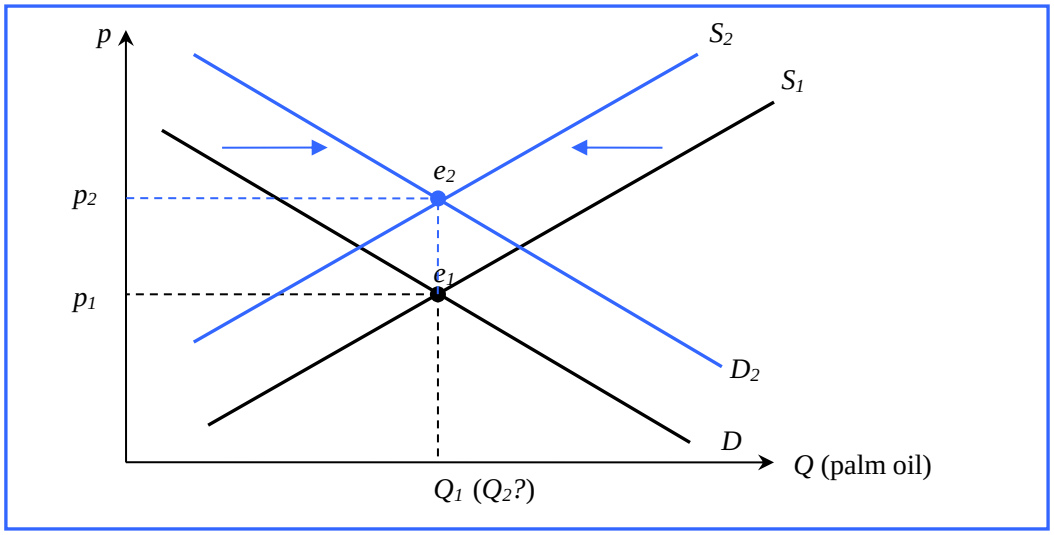


8.b. The own-price elasticity of demand for sunflower oil is -0.54, which is inelastic. The quantity demanded for sunflower oil will drop by 0.54% when price increases by 1%, ceteris paribus.

The own-price elasticity of demand for palm oil is -0.46, which is inelastic. The quantity demanded for sunflower oil will drop by 0.46% when price increases by 1%, ceteris paribus.

The cross-price elasticities between sunflower oil and palm oil is 0.41 (positive), indicating that they are substitutes. When the price of sunflower oil increases by 1%, the quantity demanded for palm oil will increase by 0.09% (very small impact), ceteris paribus.

8. c. As the price of sunflower oil increases due to the war, consumers would substitute it by palm oil. It leads to an increase in demand for palm oil (although only slight increase), shifting the demand curve rightward. Besides, the export restriction of Indonesia will reduce the supply of palm oil. The war reduces the supply of sunflower oil, shifting the supply curve leftward. As a result, the equilibrium price of sunflower oil will rise from p_1 to p_2 and the impact on equilibrium quantity is ambiguous, depending on the relative size of the increase in demand or the decrease in supply.



8.d. Nestlé and P&G face higher production costs as supply disruptions raise input prices. Finding certified, deforestation-free suppliers is more difficult, so firms must choose between higher costs (maintaining environmental standards) and cheaper, potentially non-certified sources (risking their sustainability reputation). There creates a trade-off between cost management and maintaining sustainability.