Problem set # 2: ANSWERS

1. The equilibrium solution with no government intervention is \(1000 - 2p = 100 + p \Rightarrow p^* = 300\) and \(Q^* = 400\). When the quota is imposed at 300 units, supply cannot exceed that level, regardless of price. Thus, the supply curve becomes vertical at 300 units. The new equilibrium quantity is 300 and price is determined by where the supply curve with the quota \((S_{\text{quota}})\) intersects the demand curve. To solve for the price, plug the quota value, 300, into the demand equation: \(1000 - 2p = 300 \Rightarrow p^* = 350\).

2. If \(Q = 200 - 10p\), \(Q'(p) = -10\), and thus \(\varepsilon = \frac{p}{q}Q'(p) = (-10)\frac{p}{200-10p}\). For \(p = 5\), \(\varepsilon = (-10)\frac{5}{200-50} = -\frac{1}{7}\). For \(p = 15\), \(\varepsilon = (-10)\frac{15}{200-150} = -3\).

3. \(Q = 3000 - 5p + 10p_x - 2p_z + 0.1m\). If \(p = 80\), \(p_x = 50\), \(p_z = 150\), and \(m = 30,000\).
   \(Q = 3000 - 5 \times 80 + 10 \times 50 - 2 \times 150 + 0.1 \times 30000 = 5800\)
   1 Price elasticity of demand: \(\varepsilon = (-5)\frac{80}{5800} = -0.068966\)
   2. Cross price elasticity with respect to commodity \(x\) is \(\varepsilon = (10)\frac{50}{5800} = 0.086207\)
   3. Cross elasticity with respect to commodity \(z\) is \(\varepsilon = (-2)\frac{150}{5800} = -0.05172\)
   4. Income elasticity is \(\varepsilon = (0.1)\frac{30000}{5800} = 0.51724\)

4. The incidence on consumers is \(\iota = 0.02/0.05 = 0.4\). Thus, the incidence on firms is 0.6. If the supply elasticity is 0.8, the demand elasticity must be \(-0.9\).

5. Perloff, third edition: question 9 page 71
   If the demand curve is perfectly elastic (horizontal), and the supply curve is perfectly inelastic (vertical), the effect of a tax would be no change in equilibrium quantity and no change in price paid by consumers, and sellers would bear the entire burden of the tax.
6. Perloff, third edition: question 13 page 71
When the state raises the minimum wage, all workers that remain employed will continue to pay the tax rate $\alpha$ on each dollar earned. If the equilibrium quantity does not fall by much (demand is inelastic), total payments to labor would increase, as would tax revenues. If demand is elastic, when wages rise, total payments to labor will fall, and tax revenues will go down.

7. Perloff, third edition: problem 16 page 71
If $Q = 1275$, then plugging in the prices given, $Y = 1.5$. The income elasticity is $\xi = 0.2(1.5/1275) = 2.35 \times 10^{-4}$.

8. Perloff, third edition: problem 18 page 71
Given the initial market demand and supply functions, the equilibrium price and quantity are $Q = 20$, $p = 80$. With the tax, the supply curve becomes $p = 20 + 4Q$, or $Q' = -5 + 0.25p$. The new price and quantity are $Q' = 16$, $p' = 84$. Consumers pay 0.2 of the tax, and producers receive 64. The revenue from the tax could be used to fund work crews to clean up the bottle litter. Graph