ECON 110, Professor Hogendorn

Problem Set 1 Answers

1. *HardBop_a.* a) P b) N c) P d) N or P, depending on interpretation of "too high:" "too high to achieve positive condition X" or "undesirably high." e) P f) N

2. *Electricity_a.*

   (a) Total benefit minus total opportunity cost is

   $$v(k) = 2.7k^{2/3} - 0.2k$$

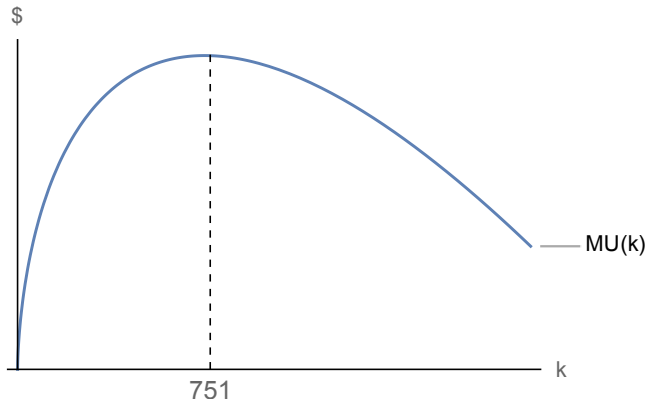
   The first order condition, which sets marginal benefit minus marginal opportunity cost equal to 0, is

   $$\frac{dv}{dk} = \frac{2}{3}2.7k^{-1/3} - 0.2 = 0$$

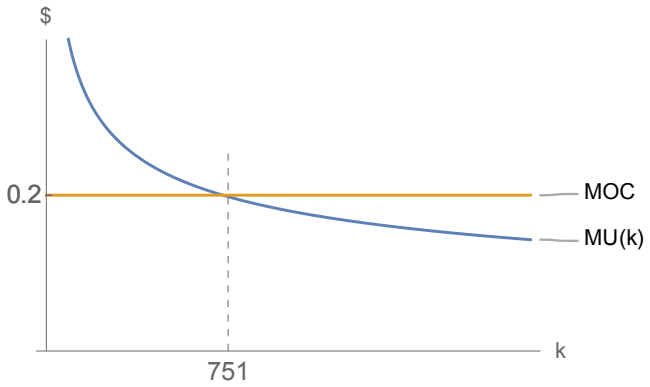
   Solving this out gives

   $$1.8k^{-1/3} = 0.2$$
   $$k^{-1/3} = 0.11$$
   $$k = 751$$

   (b) The value function makes a hill shape, where the maximum value occurs at the top of the hill which is $k = 751$.



(c) This graph takes the X shape so common in economics:



3. *SUVs_a.*

(a) The derivatives are:

$$\frac{dQ}{dP} = -6040.5P^{-2.5} < 0 \qquad \frac{d^2Q}{dP^2} = 15101.25P^{-3.5} > 0$$

The first derivative is negative (for any value of P), thus the function must slope down. The second derivative is positive, thus the slope must be getting less steep as price increases. The graph looks like in part (d).

(b) Setting demand equal to supply gives:

$$\begin{aligned} 4027P^{-1.5} &= 258.3P \\ 15.59 &= P^{2.5} \\ P = 3 & \qquad Q = 775 \end{aligned}$$

(c) Gas is a ***complement*** to SUVs. If the price of a complement rises, it produces a negative demand shift. Therefore, we expect a lower demand for SUVs at *any* price of SUVs, and the demand curve $Q = 3700P^{-1.5}$ is the more likely result.

(d) Setting demand equal to supply gives:

$$\begin{aligned} 3700P^{-1.5} &= 258.3P \\ 14.32 &= P^{2.5} \\ P = 2.90 & \qquad Q = 749 \end{aligned}$$

The graph of what happened is: