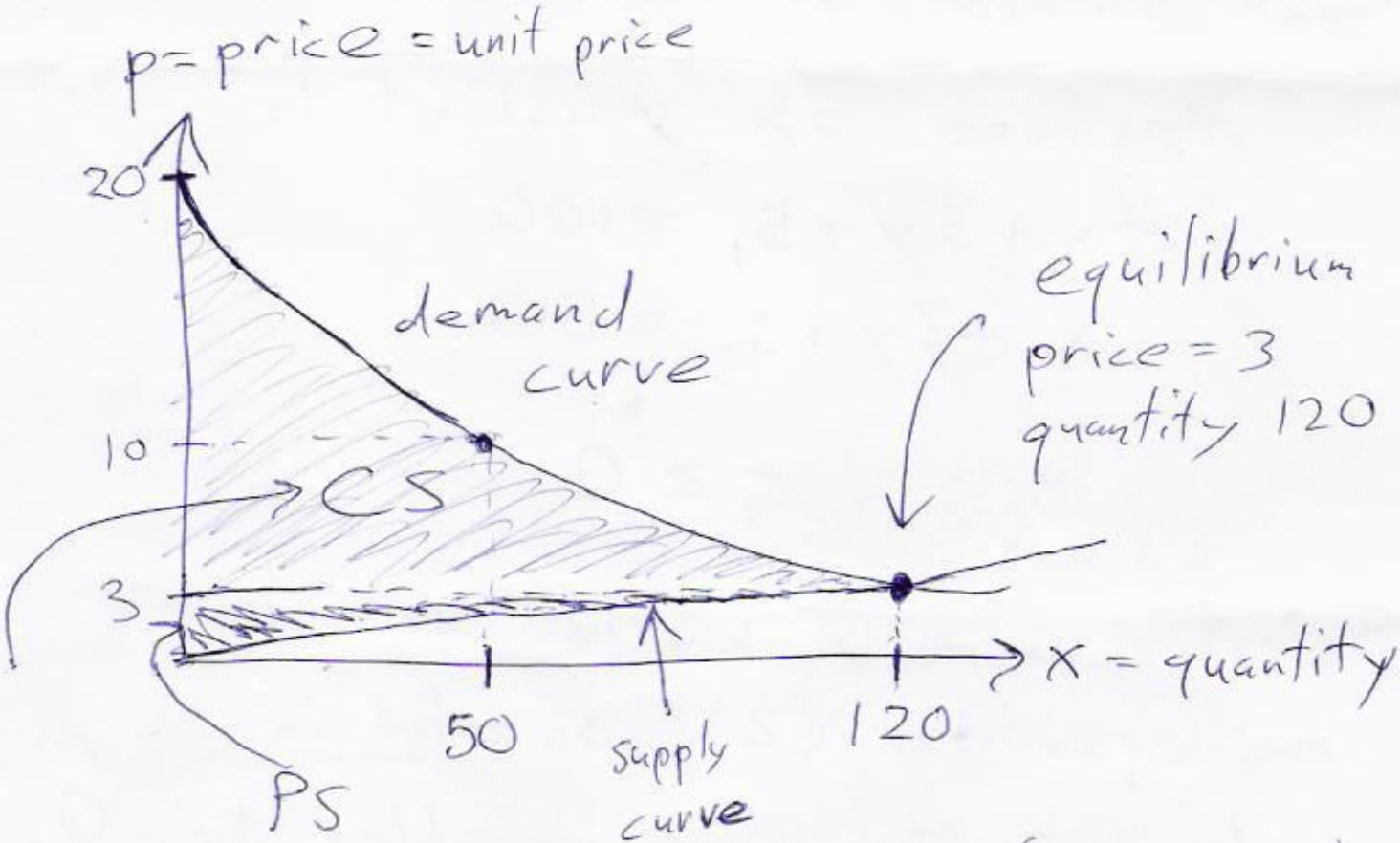
(14-2) Consumer surplus & producer surplus:

C.S. = total subjective values of a good/service according to the buyers minus total amount paid to producers

Assume just 1 price.

P.S. = ~~total subjective value~~ total amount paid to the producers minus total subjective costs of producing a good/service.



$$S(x) = \frac{x}{40} \quad \text{(in dollars)}$$

price demanded $D(x) = ?$

price-elasticity ~~elasticity~~

Assume constant of demand &

$$D(50) = 10 \quad \& \quad D(120) = 3.$$

$$\frac{d(\ln x)}{d(\ln D)} = \frac{dx/x}{dD/D} = \text{constant}$$

$$\frac{d(\ln x)}{d(\ln D)} = \frac{\Delta(\ln x)}{\Delta(\ln D)} = \frac{\ln 120 - \ln 50}{\ln 3 - \ln 10}$$

$$-0.73 = \frac{d(\ln x)}{d(\ln D)} = \frac{\Delta(\ln x)}{\Delta(\ln D)}$$

$$-0.73 = \frac{\ln x - \ln 50}{\ln D - \ln 10}$$

$$-0.73 = \frac{\ln (x/50)}{\ln (D/10)}$$

$$-0.73 \ln \frac{D}{3} = \ln \frac{x}{50}$$

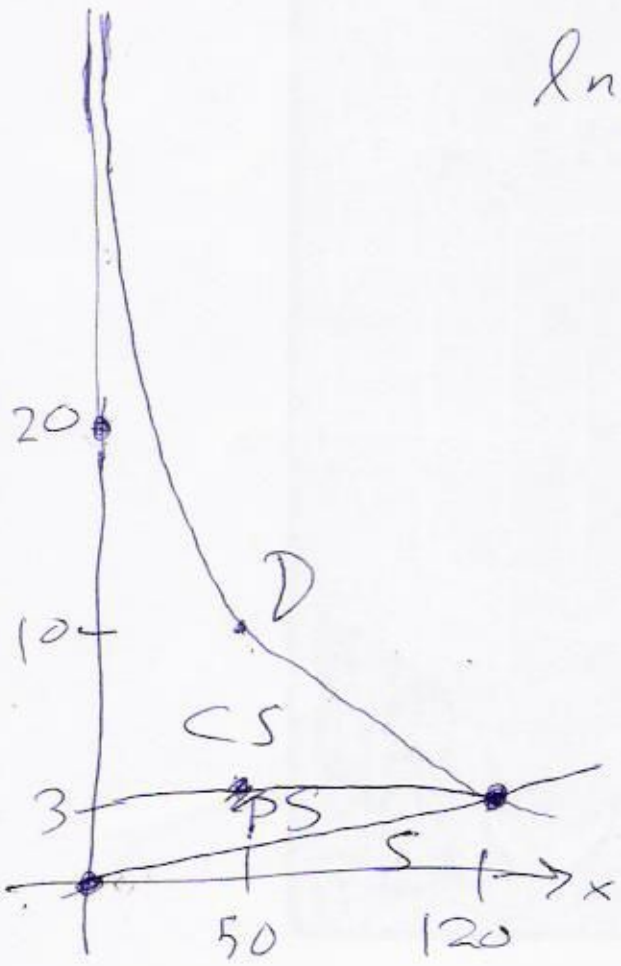
$$\ln \left[\left(\frac{D}{10} \right)^{-0.73} \right] = \ln \frac{x}{50}$$

$$\left(\frac{D}{10} \right)^{-0.73} = \frac{x}{50}$$

$$\frac{D}{10} = \left(\frac{x}{50} \right)^{\frac{-1}{0.73}}$$

$$D = 10 \left(\frac{x}{50} \right)^{-1.37}$$

$$S = \frac{x}{40}$$



From $x = 1$ to $x = 120$,

the estimated CS & PS

are $\int_1^{120} (D - 3)\,dx$ & $\int_1^{120} (3 - S)\,dx$

Linear demand model:

x	0	50	120
D	20	10	3

Crude approximation:

line through first & last points:

$$\frac{\Delta D}{\Delta x} = m = \frac{20 - 3}{0 - 120} = -\frac{17}{120}$$

$$\frac{D - 20}{x - 0} = m = -\frac{17}{120}$$

$$D = 20 - \frac{17}{120}x$$

$$x = 50 \Rightarrow D \approx 13$$

Slightly less bad: "LinReg" to fit a line.

No problem near $x=0$ with linear model.

$$CS = \int_0^{120} (D - 3)\,dx$$

$$PS = \int_0^{120} (3 - 5)\,dx$$

$$CS = \int_0^{120} \left(20 - \frac{17}{120}x - 3\right)dx$$

$$\left[20x - \frac{17}{120}\left(\frac{x^2}{2}\right) - 3x\right]\Bigg|_0^{120}$$

$$= \left[20(120) - \frac{17}{120}\left(\frac{120^2}{2}\right) - 3(120)\right]$$

$$- [0 - 0 - 0] = \$3060$$

HW #51, 54 (14-2)

#58 ← use calculator to find the equilibrium where D = S