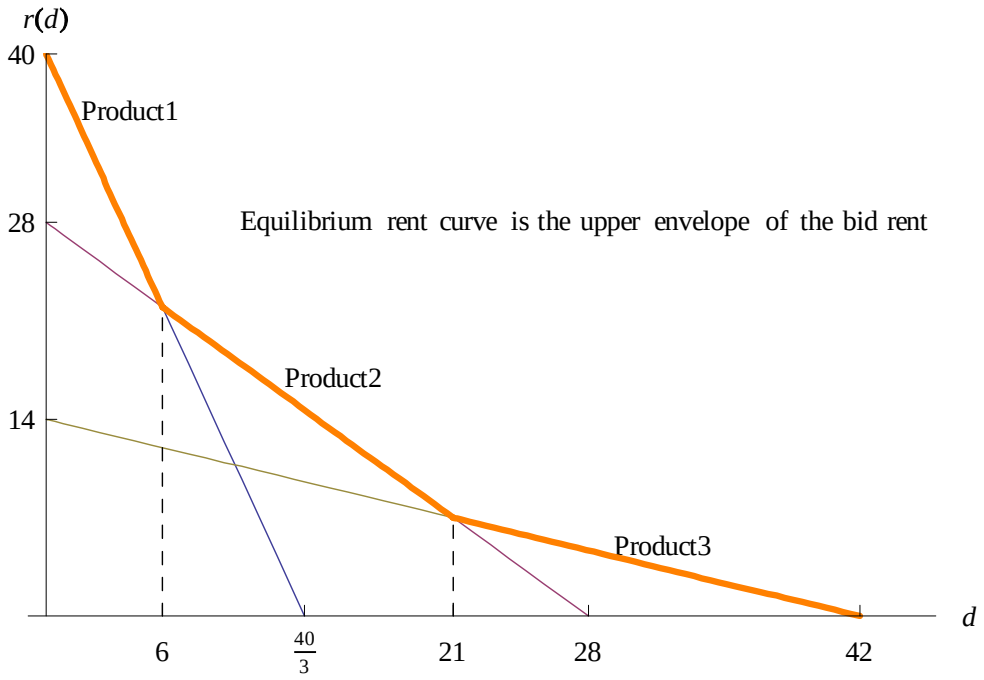
Problem Set 1 Answer Key

Jan 2012

Question 1. Production advantage is higher in city A. Amenity level is ambiguous.

Question 2.

a) Product 1: r[d] = 40-3d
Product 2: r[d] = 28 - d
Product 3: r[d] = 14 - d/3
b)



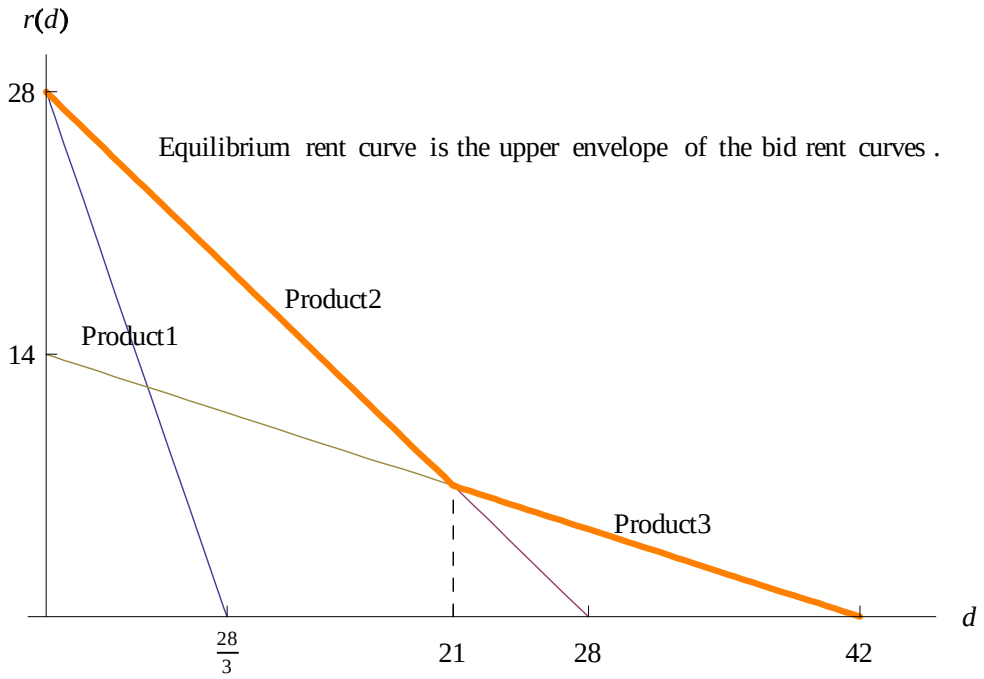
c) Boundary between product 1 and Product 2: 6.
Boundary between product 2 and 3: 21.
Boundary between product 3 and fallow: 42.

d) Refer to the diagram in b)

e) Product 1 takes land from $d = 0$ to $d = 6$. Thus, its land size is equal to $6^2\pi = 36\pi$.
Product 2 takes land from $d = 6$ to 21. Thus, its land size is equal to $21^2\pi - 6^2\pi = 405\pi$.
Product 3 takes land from $d = 21$ to 42. Thus, its land size is equal to $42^2\pi - 21^2\pi = 1323\pi$.

f) The aggregate revenue of firms to produce a product can be expressed as individual farm revenue times the total number of farms producing the product. Since each farm uses one unit size of land, the total number of farms producing the product is equal to the aggregate land size we calculated in e). Thus, for product 1, the aggregate revenue is $q_i \cdot p_i \cdot n_i = 1 \cdot 50 \cdot 36\pi = 1800\pi (= 5654.87$ approximately). For product 2, the aggregate revenue is $1 \cdot 48 \cdot 405\pi = 19440\pi (= 61072.6$ approximately). For product 3, the aggregate revenue is $1 \cdot 44 \cdot 1323\pi = 58212\pi (= 182878$ approximately).

g) Product 1 will not be planted any more (except d=0).



i) Bid rent for product 1: $-3d + 28$.

Bid rent for product 2: $-d + 28$.

Bid rent for product 3: $-\frac{1}{3}d + 14$.

ii) Boundary between product 2 and 3 occut at $d = 21$.

iii) Total land area for product 2 is $21^2\pi = 441\pi = (= 1385.44$ approximately) and total land area for product 3 is $42^2\pi - 21^2\pi = 1323\pi (= 4156.33$ approximately).

iv) Aggregate revenue for product 2 is $1 \cdot 48 \cdot 441\pi = 21168\pi\,(= 66501.2$ approximately). Aggregate revenue for product 3 is $1 \cdot 44 \cdot 1323\pi = 58212\pi (= 181878$ approximately).

Question 3. 1.

a) slope of bid rent=-2*20=-40

RH(10) = 800 = RH(0) -40*10; RH(0) = 1,200

RH(d)= 1,200-40d

b) The zero profit condition: 5*(1,200-40d) - cc - Rc(d)=0

Rc(d)=-200d+6,000-cc and Rc(10)=1,000=-200*10+6,000-cc ; cc=3,000

Thus, Rc=3,000-200d