ECON 301, Professor Hogendorn, Spring 2013

Second Midterm Exam Answers

1. *Luxray_a.*

   (a)

   $$AC(y) = \frac{TC(y)}{y} = \frac{y^2 + 10}{y} = y + \frac{10}{y}$$

   $$AVC(y) = \frac{TVC(y)}{y} = \frac{y^2}{y} = y$$

   $$MC(y) = \frac{dTC(y)}{dy} = \frac{d}{dy}(y^2 + 10) = 2y$$

   Luxray maximizes profits by producing output until MC(y)=p, because up to that point each unit costs less than it sells for, and after that point each unit costs more than it sells for. In this case, MC(y)=p implies 2y=100, or y^*=50.

   (b)

   $$\Pi(50) = TR(50) - TC(50) = 5000 - (2500 + 10) = 2490$$

   $$\Pi(50) = (p - AC(50))\,50 = (100 - 50.2)50 = 2490$$

   $$\Pi(50) = (p - AVC(50))\,50 - F = (100 - 50)50 - 10 = 2490$$

   (c) We saw in part (b) that Luxray currently earns a super-normal profit. Since there is free entry into this market, firms will want to enter. This will shift market supply to the right, lowering price. As you can see from Luxray's upward-sloping marginal cost curve, this will end up reducing the profit-maximizing level of output.
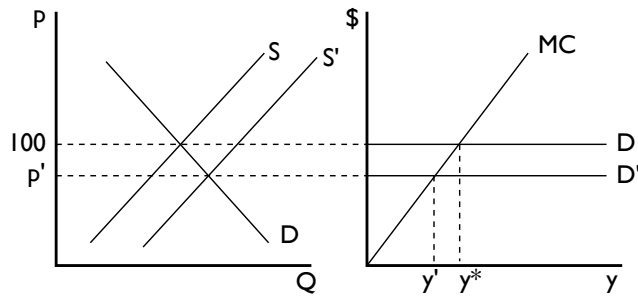
2. *Snowboards.*

(a) Both the equilibrium quantity and price will fall as a result of the shift in demand.
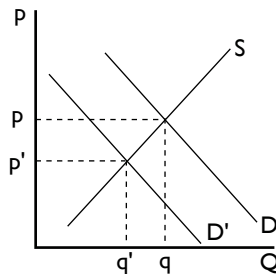
(b) There is no deadweight loss because there is no potential consumer or producer surplus that is not achieved at the market equilibrium. There *is* a reduction in the total consumer and producer surplus obtained from this market, but it is solely due to a change in consumer tastes, not to a market failure or distortion of the market.

(c) First set demand equal to supply, then solve for p^*, and then differentiate:

$$a - p = 3p$$
$$p^* = \frac{a}{4}$$
$$\frac{dp^*}{da} = \frac{1}{4} > 0$$

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(d) Again set demand equal to supply. Then totally differentiate
and try to rearrange into elasticity form:

$$x(p, a) = s(p)$$

$$\frac{\partial x}{\partial p} dp + \frac{\partial x}{\partial a} da = \frac{\partial s}{\partial p} dp$$

$$dp \left(\frac{\partial x}{\partial p} - \frac{\partial s}{\partial p} \right) = -\frac{\partial x}{\partial a} da$$

$$\frac{dp}{da} = -\frac{\frac{\partial x}{\partial a} \quad \frac{p}{x}}{\frac{\partial x}{\partial p} - \frac{\partial s}{\partial p} \frac{p}{x}}$$

$$\frac{dp}{da} = -\frac{\frac{\partial x}{\partial a} \frac{p}{x}}{\varepsilon_D - \varepsilon_S}$$

(e) That's the best I can do for part (d). But if we define $\varepsilon_a = \frac{\partial x}{\partial a} \frac{a}{x}$
as the elasticity of demand with respect to shifter a, and if we
look for the elasticity of p with respect to a instead of just the
derivative, we can do a little better. Continuing from the end
of part (d):

$$\frac{dp}{da} \frac{a}{p} = -\frac{\frac{\partial x}{\partial a} \frac{p}{x} \frac{a}{p}}{\varepsilon_D - \varepsilon_S}$$

$$\varepsilon_{pa} = \frac{\frac{\partial x}{\partial a} \frac{a}{x} \frac{p}{p}}{\varepsilon_D - \varepsilon_S}$$

$$\varepsilon_{pa} = \frac{\varepsilon_a}{\varepsilon_D - \varepsilon_S}$$

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