Math 105, Spring 2011

Practice Problems on Consumer and Producer Surplus

In each of the following systems the first equation defines a demand curve and the second equation defines a supply curve. Determine the equilibrium points, the consumer surplus, and the producer surplus. Also indicate these quantities as points and areas of regions in a coordinate plane.

1. $p = 10 - 0.4q, \quad p = 2 + 0.6q$

Answer: $(p_e, q_e) = (6.8, 8),\ CS = 12.8,\ PS = 19.2.$

2. $p + 0.2q = 400, \ \ p - 0.4q = 40$

Answer:$(p_e, q_e) = (280, 600),\ CS = 36000,\ PS = 72000$

3. $q = 5000 - 50p, \ \ q = 100p - 1000,$

Answer: $(p_e, q_e) = (40, 3000);\ CS = 90000;\ PS = 45000$

4. $p = -0.1q + 200, \ \ p = 0.2q + 20.$

Answer:$(p_e, q_e) = (140, 600);\ CS = 18000;\ PS = 36000$

5. $75p + 45q = 2250, \ \ 7.5p - 3q = 37.5$

Answer: $(p_e, q_e) = (15, 25);\ CS = 187.5;\ PS = 125$

6. $q + 250p = 60000, \ \ -q + 500p = 15000.$

Answer: $(p_e, q_e) = (100, 35000);\ CS = 2450000;\ PS = 1225000$

Find the equilibrium quantity and price, the consumer surplus, and the producer surplus for each of the following demand and supply curves:

7. $D(q) = -0.4q + 23, \ \ S(q) = 0.03q^2 + 3$

Answer: $(p_e, q_e) = (15, 20);\ CS = 80;\ PS = 160$

8. $D(q) = -0.2q + 60, \ \ S(q) = 0.003q^2 + 0.02q + 8$

Answer: $(p_e, q_e) = (40, 100);\ CS = 1000;\ PS = 2100$

9. $D(q) = 0.3(q-20)^2,\ \ S(q) = 2q + 10,\ \ 0 \le q \le 20$

Answer: $(p_e, q_e) = (30, 10);\ CS = 400;\ PS = 100$

10. $D(q) = 0.005(q-100)^2,\ \ S(q) = 0.1q + 2\ \ 0 \le q \le 100$

Answer: $(p_e, q_e) = (8, 60);\ CS = 1080;\ PS = 180$

11. $D(q) = \frac{25}{q+2},\ \ S(q) = q + 2$

Answer: $(p_e, q_e) = (5, 3);\ CS = 25\ln(5/2) - 15;\ PS = 4.5$

12. $D(q) = \frac{110}{q+4},\ \ S(q) = q + 4$

Answer: $(p_e, q_e) = (11, 6);\ CS = 110\ln(5/2) - 66;\ PS = 18$

13. $D(q) = (q-5)^2,\ \ S(q) = q^2 + q + 3,\ 0 \le q \le 5$

Answer: $(p_e, q_e) = (9, 2);\ CS = 44/3;\ PS = 22/3$

14. $D(q) = 0.03(q-50)^2,\ \ S(q) = 0.03q^2 + q + 3,\ 0 \le q \le 50$

Answer: $(p_e, q_e) = (30.72, 18);\ CS = 369.36;\ PS = 278.64$