Question 1

(a) The expected payment 8,000 times 0.2, i.e.,

the premium is 1,600.

The person will **not buy** the anti-theft device.

The person's (expected) utility is 9.036.

(b) The cost of insurance is now 400. So costs are 410, and wealth is 9,590.

The person's (expected) utility is 9.168.

Hence, the government's policy **improves** welfare.

(c) Unnecessary tests, going to he doctor when it is not necessary.

Question 2 The expected utility from A is

$$\sqrt{40,000 - 120} = 199.70.$$

The expected utility from insurance *A* is 199.70.

The expected utility of a good driver if he chooses not to be insured is

$$\frac{5}{1000}\sqrt{40,000 - 17,500} + \frac{995}{1000}\sqrt{40,000} = 199.75.$$

The expected utility of an uninsured good driver is 199.75.

The expected utility of a bad driver if he chooses not to be insured is

$$\frac{11}{1000}\sqrt{40,000 - 17,500} + \frac{989}{1000}\sqrt{40,000} = 199.45.$$

The expected utility of an uninsured bad driver is 199.45.

The expected utility of a good driver if he chooses insurance B is

$$\frac{5}{1000}\sqrt{40,000-10,000-40}+\frac{995}{1000}\sqrt{40,000-40}=199.77.$$

The expected utility of a good driver with insurance $\boldsymbol{B}$ is 199.77.

The expected utility of a bad driver if he chooses insurance B is

$$\frac{11}{1000}\sqrt{40,000-10,000-40}+\frac{989}{1000}\sqrt{40,000-40}=199.61.$$

The expected utility of a bad driver with insurance $\boldsymbol{B}$ is 199.61.

A good driver will therefore choose **insurance $\boldsymbol{B}$**.

A bad driver will therefore choose **insurance $\boldsymbol{A}$**.

Question 3 A firm's cost function is given by $c(Q) = 450 + 2Q^2$. Thus,

MC(Q) = $4Q$, $AC(Q) = \frac{450}{Q} + 2Q$.

$AC'(Q) = -450/Q^2 + 2$. Thus, $AC'(Q) = 0$ when $Q = 15$.

Average costs are minimized at $\boldsymbol{Q} = 15$.

Average costs are increasing for $\boldsymbol{Q} \geq 15$.

Question 4 $\text{MP}_K = L^2$, $\text{MP}_L = 2KL$. Thus, $2 = \frac{L^2}{2Kl} = \frac{L}{2K}$, which implies $4K = L$. To produce 64 units:

$\boldsymbol{K} = 4$, $\boldsymbol{L} = 16$.

The firm's costs are 24.

Question 5

(a) MC $= p$ implies $P = 2Q$ and $P = 10Q$. Thus, firm supply functions are $Q = P/2$ and $Q = P/10$. Industry supply is $Q_S(P) = 30P + 10P = 40P$. If demand equals supply then $1,000 - 10P = 40P$. Thus,

In the market equilibrium, $P = 20$.

Each domestic firms produces $Q = 2$.

Each foreign firm produces $Q = 10$.

Total supply is $Q = 800$.

Revenue of a domestic firm is 40. Costs are 60.

The profit of a domestic firms is -20.

Revenue of a foreign firm is 200. Costs are 140.

The profit of a foreign firms is 60.

(b) Now supply is only $Q = 30P$. Thus, $1,000 - 10P = 30P$, which implies

$P = 25$, and total supply is $Q = 750$.

(c) Since $Q = 1,000 - 10P$, we get $P = 100 - (1/10)Q$. The net benefit from (a) is $\int_0^{800} 100 - (1/10)Q\,dQ - (20)(800) = 48,000 - 16,000 = 32,000$, and $\int_0^{750} 100 - (1/10)Q\,dQ - (25)(750) = 46,875 - 18,750 = 28,125$ from (b). Thus,

The change in surplus is $-3,875$.

Suppose the U.S. government pays to each domestic firms just enough money to cover losses. Then the government must pay 20 to 100 firms, i.e., a total of 2,000. Then (to consumers and firms in the U.S.)

the net-benefit of this policy is 1,875.

The revenue of a foreign firm is $(25)(12.5) = 312.50$. Costs are 196.25, resulting in a profit of 116.25, i.e., the profit increased by 56.25 units. Total increase is therefore 3,375. Thus,

the net-benefit of this policy is $-1,500$.

Question 6

(a) Price elasticity of demand is $-20P/(1,000-20P) = P/(P-50)$. Thus,

$$10 = P\left(1 + \frac{P-50}{P}\right) = P + P - 50.$$

Thus,

The profit maximizing price is $P = 30$.

Thus, $Q(30) = 400$ units are produced. Revenue is therefore $12,000$. Costs are $C(400) = 10,000$. Thus,

The firm's profit is 2,000.

(b) It is optimal to set $P = \text{MC}$. Thus, $P = 10$. At this price, demand by an individual consumer is $Q = 8$. Since $Q = 10 - 0.2P$, we get $P = 50 - 5Q$. Net surplus is $\int_0^8 50 - 5Q\,dQ - (8)(10) = 240 - 80 = 160$.

$F = 160$, $P = 10$.

Revenue per consumer is 160+80=240. Since there are 100 consumers, total revenue is 24,000. Total demand is 800. Thus, costs are $C(800) = 6,000 + 8,000 = 14,000$. Thus,

The firm's profit is 10,000.

Question 7 The inverse demand functions are given by $p = 160 - 2Q$ for A and $p = 20 - 0.25Q$ for B. The airline charge B costumers the amount equal to the the area underneath the inverse demand curve between 0 and 10. Thus,

An economy class ticket will cost 187.50

The surplus of a type A consumer of getting quality 10 is area underneath $p = 160-2Q$ between 0 and 10, which is 1,500. The net-surplus is therefore, 1,312.50.

It is optimal to give A the maximum level of quality $y = 80$. The surplus of a type A consumer is 6,400. Therefore, a business class ticket can cost at most 6,400-1,312.50, i.e.,

A business class ticket will cost 5,087.50

Question 8 In state h we solve $\max_P (200 - P)P$ s.t. $200 - P \leq Q$. The Lagrangean is $\mathfrak{L} = (200 - P)P - \lambda(200 - P - Q)$. Thus, $200 - 2P + \lambda = 0$. If $\lambda > 0$ then the constraint binds, i.e., $P = 200 - Q$. If $\lambda = 0$ then we get $P = 100$, and hence $Q \geq 100$. Thus, the constraint binds when $Q \leq 100$.

Thus, in state h:

The firm's revenue is $(200 - Q)Q$ if $Q \leq 100$.

The firm's revenue is $10,000$ if $Q \geq 100$.

Now we solve $\max_P (100 - 2P)P$ s.t. $100 - 2P \leq Q$. The Lagrangean is $\mathfrak{L} = (100 - 2P)P - \lambda(100 - 2P - Q)$. Thus, $100 - 4P + 2\lambda = 0$. If $\lambda > 0$ then the constraint binds, i.e., $Q = 100 - 2P$, which implies $P = 50 - 0.5Q$. If $\lambda = 0$ then we get $P = 25$, and hence $Q \geq 50$. Thus, the constraint binds when $Q \leq 50$.

In state l:

The firm's revenue is $(50 - 0.5Q)Q$ if $Q \leq 50$.

The firm's revenue is 1,250 if $Q \geq 50$.

Suppose that $Q \leq 50$. Then profit is $0.5(200 - Q)Q + 0.5(50 - 0.5Q)Q - 14Q$. Thus, $0.5(200 - 2Q) + 0.5(50 - Q) - 14 = 0$, which implies $Q = 74$.

Now suppose that $50 \leq Q \leq 100$. Then profit is $0.5(200 - Q)Q + 0.5(1,250) - 14Q$. Thus, $0.5(100 - 2Q) - 7 = 0$, which implies $Q = 86$.

Finally, note that for $Q \geq 50$, profit is $0.5(10,000) + 0.5(1,250) - 14Q$, and the first order condition has therefore no solution. Thus, $Q = 86$ is the profit maximizing choice.

The firm will produce $Q = 86$.

Prices in the high and low demand state, respectively are given by

$P_h = 114$, $P_l = 25$.

Excess inventory in the low state is 36.