Question 1

(a) Suppose that $\alpha = 0.1$ and $x = 2,000$. If a type B worker takes the test, then his benefit is $0.1(50,000 - 15,000) = 1,500$ (the difference between the wages times the probability that he passes the test. Thus, the cost exceeds the benfit and

Only type A workers take the test

(b) The benefit for a B type of taking the test must equal cost x, i.e., $\alpha(50,000 - 35,000) = x$. Thus,

$$\mathbf{x = 15,000\alpha.}$$

Question 2 To induce the agent to choose the high effort level, $0.5w_l + 0.5w_h - \phi(e_h) \geq 0.9w_l + 0.1w_h - \phi(e_l)$, i.e., $0.4(w_h - w_l) \geq 30$ which implies $w_h - w_l \geq 75$. In addition, the person must get a payoff of at least zero, i.e., $0.5(w_h + w_l) \geq 50$, i.e., $w_h + w_l \geq 100$. Further, to maximize profits the firm will minimize the payment to the agent, thus, $w_h + w_l = 100$. Inserting this in the first constraint yields, $2w_h \geq 175$, i.e., $w_h \geq 77.5$.

Thus, any payment works where $w_h \geq 87.5$ and $w_h + w_l = 100$.

Consider the most intuitive of these schemes where $w_h = 100$. In this case, the agent would be maximally penalized when selecting the low effort level. The firm's payoff is $0.5(500 - 100) + 0.5(200) = 250$.

The firm's maximum expected payoff is 300.

For, example, the maximum payoff can be obtained by choosing

$$\mathbf{w_l = 0, w_h = 100.}$$

Question 3

(a) This is a standard lemons problem, in which only the "lemon" will be traded, i.e., **only forgerys** will be sold.

In case paintings are sold in equilibrium, the price will be between **200 Dollars** and **300 Dollars**.

(b) Owners of genuine paintings will disclose the information. However, to recover cost of disclosure they will have to sell for at least 8,500 Dollars. For owners of forgeries, there is no reason to expend costs on revealing this information. Thus, information will be disclosed by (*circle the correct answer*)

only sellers of a genuine painting.

In case forgerys are sold in equilibrium, the price will be between **200 Dollars** and **300 Dollars**.

In case genuine paintings are sold in equilibrium, the price will be between **8,500 Dollars** and **9,000 Dollars**. *Leave blank if no genuine paintings are sold*

(c) Now owners of forgeries will not sell, since their cost, which includes the information disclosure cost, exceeds the buyer's willingness to pay. Note that the law does not increase the amount of information that is revealed to buyers. Thus, the law generates an inefficiency.

Question 4 Suppose that a cost function is $C(Q) = 20 + 8Q^2$. Then

Fixed costs are $FC = 20$

Marginal costs are $MC(Q) = 16Q$

Average fixed costs are $AFC(Q) = 20/Q$

Average variable costs are $AVC(Q) = 8Q$

Average total costs are $ATC(Q) = 20/Q + 8Q$

Question 5 $P = \text{ATC}(Q)$ implies $(72/Q)+2Q = P$. In addition $P = \text{MC}(Q)$, i.e., $4Q = P$. Thus, $(72/Q) + 2Q = 4Q$, which implies $72 = 2Q^2$, i.e., $Q = 6$. Thus, $P = 24$.

The equilibrium price is $P^* = 24$

Each firm produces $Q^* = 6$ units of output.

Question 6 $P = \text{MC}$ implies $P = Q$ for firm A and $P = 0.5Q$ for firm B.

The supply of an individual type A firm $Q_A(P) = P$

The supply of an individual type B firm $Q_B(P) = 2P$

Total industry supply is $Q_S(P) = 600P$

Thus, $Q_D(P^*) = Q_S(P^*)$ implies $20,000 - 400P^* = 600P^*$. Thus,

The equilibrium price is $P^* = 20$.

A type B firm produces $Q^* = 40$ units. Thus, revenue is 800. Costs are $C(40) = 200 + (0.25)1,600 = 600$. Thus,

A type B firm's profit is 200

You can check that type A firm's profit is negative. Suppose that as a consequence type A firms exit the market.

Now supply is $Q_S(P) = 400P$. Thus, $Q_D(P^*) = Q_S(P^*)$ implies $20,000 - 400P^* = 400P^*$. Hence,

The new equilibrium price is $P^* = 25$

A type B firm now produces $Q^* = 50$ units. Thus, revenue is 1,250. Costs are $C(50) = 200 + (0.25)2,500 = 825$. Thus,

A type B firm's profit is 425

Question 7 Note that $MRTS = 0.6L/(0.4K) = 3L/(2K)$. To minimize costs, the MRTS must be equal to the factor price ratios r/w in each country, i.e., $3L_A/(2K_A) = 1/5$ and $3L_B/(2K_B) = 1$. Therefore, $3L_A = 0.4K_A$ and $3L_B = 2K_B$. Since $L_A = L_B$ we get $0.4K_A = 2K_B$, i.e., $K_A = 5K_B$. Thus,

$K_B = 80$

Question 8

(a) The price elasticity of demand is $\epsilon_P = 2P/(2P - 800) = P/(P - 400)$. Thus, $40 = P^*(1 + (P^* - 400)/P^*) = P^* + P^* - 400$. Hence, $P^* = 220$. The airline sells $Q(220) = 800 - 440 = 360$ tickets. Revenue is therefore 79,200. Costs are $C(360) = 50,000 + 14,400 = 66,400$.

$P^* = 220$, and profit is 12,800

(b) Now $40 = P^*(1 + 0.5(P^* - 400)/P^*) = P^* + 0.5P^* - 200$. Thus, $1.5P^* = 240$. Therefore, $P^* = 160$. Thus, $Q(160) = 800 - 320 = 480$ tickets are sold, i.e., each airline sells 240. UA's revenue is 38,400. Costs are $C(240) = 50,000 + 9,600 = 59,600$.

If UA entered then

$P^* = 160$ and UA's profit is $-21,200$

As a consequence, UA will **stay out of the market**.

Question 9 The firm should set P equals marginal costs, i.e., $P = 2$. At this price, demand is $Q = 60$. The net surplus from consuming 60 units is 180.

$F = 180$, $P = 2$.

The firm's profit (per consumer) is 180.

If, instead, the firm charges a price per unit P' that maximizes profit (and does not do two-part pricing) then the price elasticity of demand is $\epsilon_P = 10P/(10P - 80) = P/(P - 8)$. Thus, $2 = P(1 + (P - 8)/P) = P + P - 8$. Thus, $P = 5$. The profit per unit is 3. Further, 30 units are sold. Thus,

$P' = 4$ and the firm's profit is 90.

Question 10 If a high demand costumer uses firm A's plan, then he will call $Q(0.1) = 160$ hours. The net surplus is $180(0.4)/2 = 36$. Thus, the high demand costumer must get a surplus of at least 36 from the new plan. The gross benefit of unlimited calls, i.e., $Q = 200$ is $200(0.5)/2 = 50$. Thus, $50 - F \geq 36$.

$F = 14$.