1. (a) The two contracts are represented as points H and L in the following figure:

(b) H is the full insurance contract on the zero-profit (or fair odds) line for type H. This line has slope \(-\frac{p_H}{1-p_H} = \frac{1}{3} = \frac{1}{3}\) and goes through the no insurance point \((W_1 = 9,000, W_2 = 15,000)\). Thus it is the line of equation \(W_2 = 18,000 - \frac{1}{3}W_1\). The intersection with the 45° line is given by the solution to \(W_1 = 18,000 - \frac{1}{3}W_1\) which is \(W_1 = 13,500\). Thus \(C_H\) is the
full-insurance contract with premium $h = $1,500 (the solution to $15,000 - h = 13,500$).
To find contract $C_L$, we need the equation of the indifference curve of the H type through $C_H$. This equation is $\frac{1}{4}\sqrt{W_1} + \frac{3}{4}\sqrt{W_2} = \sqrt{13,500}$ or $W_2 = 24,000 + \frac{1}{9}W_1 - 103.28\sqrt{W_1}$.

Contract $C_L$ is given by the intersection of this indifference curve and the zero-profit (or fair odds) line for type L. This line has slope $-\frac{p_L}{1-p_L} = -\frac{\frac{9}{10}}{\frac{1}{10}} = -\frac{1}{9}$ and goes through the no insurance point ($W_1 = 9,000$, $W_2 = 15,000$). Thus it is the line of equation $W_2 = 16,000 - \frac{1}{9}W_1$. The intersection of the two occurs at $W_1 = 9,646.17$ and $W_2 = 14,928.2$. Thus $C_L$ is the contract with premium $h = 15,000 - 14,928.2 = $71.8 and deductible $D = 15,000 - 71.8 - 9,646.17 = $5282.03.

$$C_H = (h=1,500, D=0) \quad C_L = (h=71.8, D=5,282.03).$$

(c) it must be the case that the average fair odds line be below (or at most tangent to) the indifference curve of the L type through contract L. This amounts to saying that the fraction of H type in the population is sufficiently high.

2. (a) First of all, since for every group the marginal cost of one extra unit of education exceeds the marginal benefit (in terms of increased salary), everybody will only consider only $y = 0, y = a$ and $y = b$. The inequalities are as follows.

For Group I:
(I.1) $18 > 30 + 3a - 12a$, that is, $a > \frac{4}{3}$
(I.2) $18 > 40 + 2b - 12b$, that is, $b > \frac{11}{5}$

For Group II:
(II.1) $30 + 3a - 6a > 18$, that is, $a < 4$
(II.2) $30 + 3a - 6a > 40 + 2b - 6b$, that is, $b > \frac{5}{2} + \frac{3}{4}a$

For Group III:
(III.1) $40 + 2b - 3b > 18$, that is, $b < 22$
(III.2) $40 + 2b - 3b > 30 + 3a - 3a$, that is, $b < 10$

(b) When $a = 3$ and $b = 4$, inequality (II.2) is violated. Thus Group II individuals would be better off pretending to be Group III by choosing $y = 4$.

(c) Yes, when $a = 3.5$ and $b = 6$, all the above inequalities are satisfied.