1. (a) Since the expected value of both lotteries is 40, a risk-neutral person is indifferent between them.
(b) \( C = (40,40) \). See graph below.

(c) \( C \) gives the expected value of \( A \) for sure. Thus a risk-loving person prefers \( A \) to \( C \).
(d) \( C \) gives the expected value of \( B \) for sure. Thus a risk-averse person prefers \( C \) to \( B \).
(e) For Sue the expected utility of \( A \) is equal to 6 and so is the expected utility of \( B \). Thus they lie on the same indifference curve. On the other hand, \( C \) is strictly preferred to both \( A \) and \( B \). See graph below.

(f) For Tom, \( \mathbb{E}[U(A)] = 349.613 \), while \( \mathbb{E}[U(B)] = 339.072 \). Furthermore, by risk aversion, \( C \) is strictly preferred to \( A \). Thus the indifference curves are as follows:
(g) It is $\frac{1}{4} = -\frac{1}{4}$.

(h) At any point $(y,z)$, the slope of Sue’s indifference curve that goes through that point is

$$-\frac{1}{4} \left( \frac{U'(y)}{U'(z)} \right) = -\frac{1}{4} \left( \frac{\sqrt{z}}{\sqrt{y}} \right)$$

Thus (1) at point $A$ the slope is $\frac{1}{8} = -0.125$, (2) at point $B$ it is $\frac{7}{8} = -0.875$, (3) at point $C$ it is $\frac{1}{4} = -0.25$.

(i) At any point $(y,z)$, the slope of Sue’s indifference curve that goes through that point is

$$-\frac{1}{4} \left( \frac{U'(y)}{U'(z)} \right) = -\frac{1}{4} \left( \frac{z}{y} \right)$$

Thus (1) at point $A$ the slope is $\frac{1}{16} = -0.0625$, (2) at point $B$ it is $-\frac{49}{16} = -3.0625$, (3) at point $C$ it is $\frac{1}{4} = -0.25$.

2. (a) $\frac{7}{8}\sqrt{2,500} + \frac{1}{8}\sqrt{900} = 47.5$

(b) The expected value of the no-insurance lottery is $\frac{7}{8}(2,500) + \frac{1}{8}(900) = 2,300$. Thus the equation is $\sqrt{2,300} - r = 47.5$ (the solution is 43.75).

(c) (c.1) If she insures with deductible $D$ then her wealth in the good state is

$$W_g(D) = 2,500 - h = 2,500 - \frac{1,440}{7} + \frac{9}{70} D = \frac{16,060}{7} + \frac{9}{70} D$$

and her wealth in the bad state is

$$W_b(D) = W_g(D) - D = \frac{16,060}{7} - \frac{61}{70} D$$

Thus her expected utility is

$$EU(D) = \frac{7}{8} \left( \frac{16,060}{7} + \frac{9}{70} D \right) + \frac{1}{8} \left( \frac{16,060}{7} - \frac{61}{70} D \right)$$

(c.2) Since $EU(1,000) = 47.78481$ while the expected utility of no insurance is 47.5 she would prefer to insure with a deductible of $1,000$.

(c.3) Since $EU(0) = 47.8987$ and $EU(140) = 47.90143$, she would prefer the contract with deductible $140$ to the full-insurance contract.

(c.4) The equation is

$$\frac{d}{dD} EU(D) = 0$$

that is,

$$\frac{9}{160 \sqrt{\frac{16,060}{7} + \frac{9}{70} D}} - \frac{61}{1,120 \sqrt{\frac{16,060}{7} - \frac{61}{70} D}} = 0$$

(the solution is $D = 144.52$).