$= .5(U(15) + U(20))$

if $U(20) > U(15)$

$= .5(U(15) + [U(15) + (U(20) - U(15))]$

$= .5(2U(15) + [U(20) - U(15)]$

$= U(15) + .5[U(20) - U(15)]$

$\tan \angle A = \frac{B}{C} = \frac{[U(20) - U(15)]}{20 - 15}$

but also $\tan \angle A = \frac{.5B}{.5C} = \frac{D}{.5C}$

so $D = .5B = .5[U(20) - U(15)]$

since $E = U(15)$, $E+D = U(15) + .5[U(20) - U(15)] = .5U(15) + .5U(20) = E(U)_{NI}$

ii. With insurance

Suppose that an insurance policy is offered so that if ill the person receives payoff of $5,000. The premium is actuarily fair (i.e. reflects the underlying probabilities) so that over the entire insured population E(payoff)=premium. But only those getting sick get paid off so E(payoff) = p(payoff) * payoff = .5 * 5,000 = $2,500.

Now calculate E(Y) for everyone in the insurance pool. If ill income is $15,000 but payoff is $5,000 but the premium for the insurance must still be paid. So the income of the ill person is [15,000+5.000-2,500]= $17500. If not ill income is $20,000 but premium must be paid so this persons income is [20,000-2,500]= $17500. The effect of the insurance has been to turn an uncertain income into a certain income.This means that E(U) with insurance equals U(17,500)