Economics 610 – Quiz #1 (March 16, 2001)

Closed book quiz. You have 50 minutes.
Have fun: After all, if the quiz hurts your grade, it doesn't count.
Try to avoid substituting numbers until the end, to save on algebra.

1. Assume that a porridge bowl is at some temperature between 0 and 200°, which we represent as between 0 and 2. Assume that Goldilocks is desperately hungry and absolutely must consume a single bowl of porridge. She likes porridge that is neither too hot nor too cold. Her preferences are captured by the payoff $-(1-t)^2$ for eating a bowl at temperature t. An infinite sequence of porridge bowls lie before Goldi, with i.i.d. temperatures distributed uniformly in $(0, 2)$. At a cost $c > 0$, Goldi touches the next bowl with her finger, instantly gauging its temperature. [10]

   Precisely and quantitatively describe Goldi's optimal strategy. You may assume that $c = 1/6$.

2. You are Thomas Edison trying to invent the lightbulb. It is well-known that Edison investigated everything from horsehair to string in his search for a workable light filament. Suppose that you have many possible technologies for making the lightbulb, but ultimately will *only use one*. Your goal is to maximize your discounted expected gain. Each technology i is characterized by: a cost $c_i > 0$ of investigating it to see if it might work out; an ex ante distribution $F_i(x)$ of possible profits $x \leq \bar{x} < \infty$ using this technology; a delay time resulting in a discount factor $0 < \delta_i < 1$ until any profit can be realized (but the cost must be paid up front). [15]

   In which order do you investigate the technologies?

   Assume, for some i $F_i(x)$ increases in the sense of FOSD (the new distribution of profits for technology i, $\tilde{F}_i(x)$, FOS dominates $F_i(x)$). What is the likely effect of the change on the timing of technology i investigation? What about the effect of the SOSD increase in $F_i(x)$?

   Hint: You must extrapolate on the *substance* of what you have learned.

3. Your weight is either ideal, or too high (like me). When it is ideal, you feel physically and emotionally good, and enjoy a flow payoff of 1. Then with chance $0 < p < 1$, the next period you gain weight, due to an *exogenous* snack; for some strange reason, your actions do not affect this chance. When you are too heavy, the flow payoff is 0, and you can try to lose weight; at a cost cu^2, you can return to your ideal weight with chance $u \in [0, 1]$. Payoffs are discounted each period by factor δ.

   (a) Explicitly determine the optimal policy, assuming an interior solution for u. [7]

   (b) For which δ and p is the effort level u interior? [3]