Quantitative Economics Problem Set 3

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Problem 1

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1. Write Bellman equations representing Basil's problem
Start with situation in which Basil decides to approach the vendor or terminate the search. Basil optimizes so his choice depends on the value of approaching the vendor or the value of terminating. Note that we need to take (n-1), because we will not approach the n-th vendor:

$$v(n) = max\{v^A(n), v^T(n-1)\} \tag{1}$$

Approaching next vendor (the n-th one) is associated with cost f (Basil is shy). With probability q the Vendor has the orchid (and then offer it to Basil at some price, with uniform distribution - each price equally likely). If the price is to high (the value of buying the orchid is lower than the value of not buying (so it equals to the sunk costs). Note that $-f$ below corresponds to the fact that the cost is incurred after approaching, while $V(n-1)$ shows approaching other vendors in the past. So each approach adds $-f$.

$$v^A(n) = q * E[max\{v^B(n,p), v(n-1)\}] + (1-q) * (v(n-1) - f) \tag{2}$$

Value of terminating the search is associated with the costs only. Terminating after approaching n vendors is equal to the cumulated shyness cost. Note that it is **after** having approached n vendors

$$v^T(n) = -n * f \tag{3}$$

Finally, the value of obtaining the orchid from the n-th vendor at price p is equal to:

$$V^B(n,p) = X - p - C - n * f \tag{4}$$