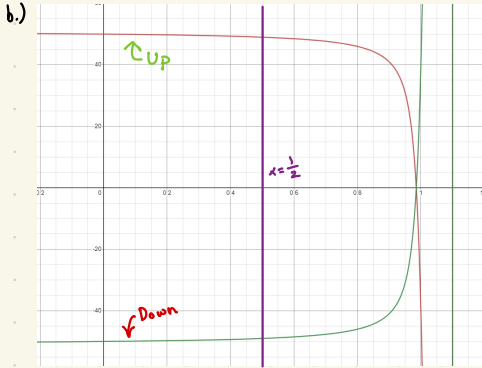


a.) Utility of up: $U(\text{up}) = 50 + \sum_{n=1}^{99} (-1)^n + \gamma^{100} (10)$

Utility of down: $U(\text{Down}) = -50 + \sum_{n=1}^{99} (\gamma^n) + \gamma^{100} (-10)$



c.) For $\gamma = \frac{1}{2}$
 $U(\text{up}) = 49$
 $U(\text{down}) = -49$

UP is recommended.

② $\text{Gain}(A) = \left(\frac{p}{p+n} \log_2 \left(\frac{p}{p+n} \right) \right) + \left(1 - \frac{p}{p+n} \right) \log_2 \left(1 - \frac{p}{p+n} \right) - \sum_{k=1}^d \frac{p_k + n_k}{p+n} B \left(\frac{p_k}{p_k + n_k} \right)$

	A_1	A_2	A_3	γ
x_1	1	0	0	0
y_2	1	0	1	0
y_3	0	1	0	0
x_4	1	1	1	1
y_5	1	1	0	1

a.) A_1 $p=2, n=3$ $B\left(\frac{p}{p+n}\right) = \frac{2}{5} \log_2 \left(\frac{2}{5} \right) + \frac{3}{5} \log_2 \left(\frac{3}{5} \right) = 0.47095$
 $\text{Gain}(A_1) = 0.47095 - \left[\left(\frac{1}{5} \right) (B(0)) + \left(\frac{4}{5} \right) B\left(\frac{1}{2}\right) \right]$
 $= 0.47095 - \left[\frac{4}{5} \left(\log_2 \left(\frac{1}{2} \right) \right) \right]$
 $= 0.47095 - 0.8 = 0.17095$

b.) A_2 $p=2, n=3$ $B\left(\frac{p}{p+n}\right) = 0.47095$
 $\text{Gain}(A_2) = 0.47095 - \left[\left(\frac{2}{5} \right) B\left(\frac{0}{2}\right) + \left(\frac{3}{5} \right) B\left(\frac{2}{3}\right) \right]$
 $= 0.47095 - \left[\frac{3}{5} B\left(\frac{2}{3}\right) \right]$
 $= 0.47095 - \left[\frac{3}{5} (0.918295) \right]$
 $= 0.47095 - 0.550977 = 0.119972$
 $B\left(\frac{2}{3}\right) = \frac{2}{5} \log_2 \left(\frac{2}{5} \right) + \frac{3}{5} \log_2 \left(\frac{3}{5} \right) = 0.918295$

c.) A_3 $p=2, n=3$ $\text{Gain}(A_3) = 0.47095 - \left[\left(\frac{1}{5} \right) B\left(\frac{1}{3}\right) + \left(\frac{2}{5} \right) B\left(\frac{1}{2}\right) \right]$
 $= 0.47095 - \left[\frac{1}{5} (0.91825) + \frac{2}{5} \right]$
 $= 0.47095 - [0.1835 + 0.4] = 0.3873$
 $B\left(\frac{1}{2}\right) = \frac{1}{3} \log_2 \left(\frac{1}{3} \right) + \frac{2}{3} \log_2 \left(\frac{2}{3} \right) = 0.918295$
 $B\left(\frac{1}{3}\right) = 1$

3.)

A_1	A_2	A_3	$\gamma(x \in R)$
0	0	0	0
1	0	0	1
1	1	0	0
1	0	1	0
1	1	1	1
0	1	0	1
0	1	1	0
0	0	1	1

