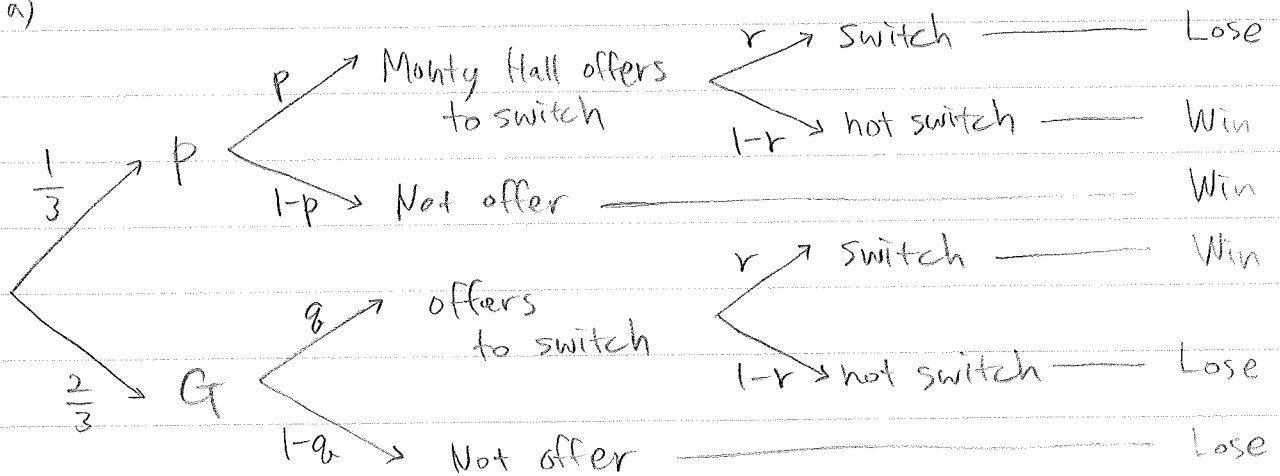


24. (a)



$$(b) \frac{1}{3} \times p \times (1-r) + \frac{1}{3} \times (1-p) + \frac{2}{3} \times q \times r$$

$$(c) P(\text{win}) = f(r) = \frac{1}{3}(2q-p)r + \frac{1}{3} \quad (0 \leq r \leq 1)$$

\therefore Either $r=0$ or $r=1$ will maximize the probability that the contestant wins since $f(r)$ is first-order polynomial with respect to r .

(d) When $2q-p=0$, $P(\text{win})$ is the same for all values of r . $\therefore p=2q$.

(e) If $r=1$, then $P(\text{win}) = \frac{1}{3}(1-p) + \frac{2}{3}q = s$.

$$1-p=s, q=s. \Rightarrow p=1-s, q=s. \quad (0 \leq p, q, s \leq 1)$$

Super!

