# TAMUR EXO

## Question 1

$$U = \frac{1}{2}\log(z) + \frac{1}{2}\log(s) \quad \text{avec} \quad R(n)s + z = Y - T(n)$$

$$z = Y - an - sR(n)$$

$$U = \frac{1}{2}\log(Y - an - sR(n)) + \frac{1}{2}\log(s)$$

$$\frac{dU}{ds} = 0 \Rightarrow \frac{1}{2s} + \frac{-R(n)}{2(Y - an - sR(n))} = 0$$

$$s\,R(n) = Y - an - sR(n) \iff \boxed{s = \frac{Y - an}{2R(n)}}$$

$$z = Y - an - \frac{Y - an}{2}$$

$$\boxed{z = \frac{Y - an}{2}}$$

$$\boxed{U^* = \frac{1}{2}\log\left(\frac{Y - an}{2}\right) + \frac{1}{2}\log\left(\frac{Y - an}{2R(n)}\right)}$$

## Question 2

$$U^* = \log\left(\frac{Y - T(n)}{2}\right) - \frac{1}{2}\log(R(n))$$

$$R(n) = \exp\left(-2u^* + 2\log\left(\frac{Y - T(n)}{2}\right)\right)$$

$$\boxed{R(n) = \exp(-2u^*)\left(\frac{Y - an}{2}\right)^2}$$

$R^*(nf) = RA$

$$RA = \exp(-2u^*)\left(\frac{Y - an}{2}\right)^2 \iff \boxed{nf = -2\frac{\sqrt{RA}\exp(u^*) + Y}{a}}$$

Question 3

$$2u^* = \frac{1}{\lambda}\log\left(\frac{y-a_1}{2}\right) + \frac{1}{\lambda}\log(1)$$

$$s = \exp\left(2u^* - \log\left(\frac{y-a_1}{2}\right)\right)$$

$$s = \frac{\exp 2u^* \times 2}{y-a_1} \text{ or } m = \frac{1}{s} \iff \lambda = \frac{y-a_1}{2}\exp(-2u^*)$$

$$\int_0^{a_1} (y-a_1) = 2N\exp(2u^*)$$

$$\left[-\frac{(y-a_1)^2}{2a_1}\right]_0^{a_1} = 2N\exp(2u^*)$$

$$\frac{y^2 - (y-a_1)^2}{4a} \times \exp(-2u^*) = N$$

$$\frac{y^2}{4a}\exp(-2u^*) - \frac{RA}{a} = N$$

$$\exp(2u^*) = \frac{y^2}{4(RA+Na)}$$

$$\boxed{a^* = \frac{1}{2}\log\left(\frac{y^2}{4(RA+Na)}\right)}$$

$$R(\lambda) = \lambda\left(\frac{RA+Na}{y^2}\right) \times \frac{(y-a_1)^2}{\lambda} = \boxed{\frac{RA+Na}{y^2}(y-a_1)^2 = R(\lambda)}$$

$$R_A = \exp(-2\alpha^*)\left(\frac{y-a_1}{2}\right)^2 \Leftrightarrow \frac{R_A\, y^2}{4(R_A+N_a)} = \frac{(y-a_1)^2}{4}$$

$$n_f = \frac{y}{a}\left(1-\sqrt{\frac{R_A}{R_a+N_a}}\right)$$

$$s = \frac{\exp 2\alpha^* x^2}{y-a_1}$$

$$s^*(1) = \frac{y}{2(R_A+N_a)} \times \frac{1}{y-a_1}$$