2(b)

$ENGS(n) = EVSI(n) - CS(n)$

$\theta_1 = 0.7,\ \theta_2 = 0.3$

$\theta = (0.7, 0.3)^T$

$P(\theta) = (0.4, 0.6)^T$

$$p(\theta|y) = \frac{\theta^y \odot (1-\theta)^{n-y} \odot p(\theta)}{[\theta^y \odot (1-\theta)^{n-y}]^T \cdot p(\theta)}$$

$$Rmat = \begin{pmatrix} 5 & -3 \\ -3 & 5 \end{pmatrix}$$

$ER(y) = Rmat \cdot p(\theta|y)$

$ER(y) = (E(R(accept\ H_0)|y),\ E(R(accept\ H_1)|y))^T$

$p(y) = \sum p(y|\theta) \cdot p(\theta) = C_y^{10} 0.7^y \cdot (1-0.7)^{10-y} \cdot 0.4 + C_y^{10} 0.3^y \cdot (1-0.3)^{10-y} \cdot 0.6$

After running R, we get:

$ER(0) = (-2.997885, 4.997885)^T$ $a'' = accept\ H_1$, $\rightarrow VSI = 0$, $p(0) = 0.0169008$

$ER(1) = (-2.993535, 4.993535)^T$ $a'' = accept\ H_1$, $\rightarrow VSI = 0$. $p(1) = 0.0726916$

$ER(2) = (-2.967059, 4.967059)^T$ $a'' = accept\ H_1$, $\rightarrow VSI = 0$. $p(2) = 0.1478033$

$ER(3)$ * $a'' = accept\ H_1 \Rightarrow VSI = 0$,

$ER(4)$ $a'' = accept\ H_1 \Rightarrow VSI = 0$

$ER(5)$ $a'' = accept\ H_1 \Rightarrow VSI = 0$

$ER(6) = (3.272, -1.272)^T$ $a'' = accept\ H_0$

$VSI = 4.5447$ $p(6) = 0.1021025$

$ER(7) = (4.614668, -2.614668)^T$ $a'' = accept\ H_0$

$VSI = 7.227336$ $p(7) = 0.1121322$

$ER(8) = (4.926378, -2.926378)^T$ $a'' = accept\ H_0$

$VSI = 7.852656$ $p(8) = 0.0942578$

$ER(9) = (4.981366, -2.981366)^T$ $a'' = accept\ H_0$

$VSI = 7.972732$ $p(9) = 0.0485097$

$ER(10) = (4.997492, -2.997492)^T$ $a'' = accept\ H_0$

$VSI = 7.994984$ $p(10) = 0.0113025$

$EVSI = 2.718218$

$ENGS = EVSI(10) - CS(10) = 2.718218 - 2.5 = 0.218218$