Problem 1

- Type I error : letting a truly innocent person go to jail.
- Type II error : letting a truly guilty person go free.

Problem 2

(a) Compute the p-value of the test at $\alpha = 0.05$

$H_0 : \mu = 14$ $\qquad$ $t = 3.024$

$H_a : \mu > 14$ $\qquad$ $\alpha = 0.05$

$n = 25$

$t_c = InvT(1-0.05, 25-1) = 1.71$

RR: $[1.71, \infty)$

$p\text{-value} = p(t \geq 3.024)$

$= tcdf(3.024, 1E99, 24)$

$= 0.0029$

Reject H_0 since $p < \alpha$

$0.0029 < 0.05$

(b) Compute the p-value of the test at $\alpha = 0.10$

$H_0 : \mu = 14$ $\qquad$ $t = -1.275$

$H_a : \mu \neq 14$ $\qquad$ $\alpha = 0.10$

$n = 25$

$t_c = InvT(1-0.10/2, 24) = 1.71$

RR: $(-\infty, -1.71] \cup [1.71, \infty)$

p-value $= p(t \trianglelefteq -1.275) \times 2$

$= tcd(-1E99, -1.275, 24) \times 2$

$= 0.1072 \times 2 \approx 0.215$

Accept H_0 since $p > \alpha$

$0.215 > 0.10$

Problem 3

$H_0 : \mu_0 = 154.8$

$H_a : \mu \neq 154.8$

$\bar{x} = 148.7$

$S = 46.5$

$n = 50$

$\alpha = 0.04$

$t_c = InvT(1-0.04/2, 50-1) = \pm 2.11$

RR: $(-\infty, -2.11] \cup [2.11, \infty)$

1. $t = -0.9276$ is not lie in RR

2. p-value $= 0.358 \implies p > \alpha$

$\therefore$ Conclude: Accept $H_0 : \mu = 154.8$ minutes at $\alpha = 0.04$. We are rejecting rejecting $H_a : \mu \neq 154.8$ minutes. There are no evidence that the typical American spend 154.8 minutes per day watching television at $\alpha = 0.04$.

Problem 4

$H_0 : \mu_A = \mu_B$ $\quad n_A = 30$ $\quad \bar{x}_A = 6.7$ min. $\quad \bar{x}_B = 7.5$ min.

$H_a : \mu_A \neq \mu_B$ $\quad n_B = 20$ $\quad s_A = 0.6$ min. $\quad s_B = 1.2$ min.

$\alpha = 0.05$

df $\quad v = n_A + n_B - 2$

$= 30 + 20 - 2 = 48$

$t_c = \text{InvT}(1 - 0.05/2,\ 48 - 1)$ $\qquad$ RR: $(-\infty, -2.012) \cup [2.012, \infty)$

$= 2.012$

1. Test Statistic: $t = -2.76$ is in RR

2. p-value: $p = 0.0106 \Rightarrow p < \alpha$

$\therefore$ Conclude: Reject $H_0 : \mu_A = \mu_B$ at $\alpha = 0.05$. There is evidence to support $H_a : \mu_A < \mu_B$. The mean performance time of sever A could be less.

$\Rightarrow$ A is faster.