

7.

(a) We should use a matched pairs t-test because the Vanguard Fund and the EAFE index are related by the year. Both are dependent on the state of the economy from year to year, so are not independent of each other.

(b) We will test whether  $\mu_D$ , the mean difference between the Vanguard Fund and the EAFE percent returns is greater than 0. That is,  $H_0: \mu_D = 0$  vs.  $H_A: \mu_D > 0$ .

A histogram of the differences (Fund – EAFE) is quite symmetric, the boxplot shows no outliers, and the npp is strongly linear. We can assume the differences are approximately normally distributed. Also, it is reasonable that  $19 < 0.1$  (All the years of the fund's existence past and future). Finally, consider the returns a random sample for all possible returns past and future.

The TI-84 T-test gives:  $t = 0.3646$ , 18 df,  $p$ -value = 0.3598.

Our  $p$ -value of 36% is quite high. We do not reject  $H_0$ . That is we do not have significant evidence that the mean difference between the Vanguard Fund and EAFE percent returns is greater than 0.

8.

(a) 
$$\sqrt{\frac{(33.89)^2}{10} + \frac{(50.74)^2}{20}} \approx 15.607 \text{ milliseconds.}$$

(b) We will construct a 95% confidence interval for the **difference** of  $\mu_1$ , the mean VOT for children, and  $\mu_2$ , the mean VOT for adults.

Since  $n_1 + n_2 = 30$ , (large enough) the distribution of  $\bar{x}_1 - \bar{x}_2$  is approximately normal. We must assume that both samples are SRS from their respective populations, otherwise we proceed with caution.

The TI-84 95% C.I for  $\mu_1 - \mu_2$  is (-12.62, 51.619) milliseconds.

We are 95% confident that the difference between mean VOT for children and adults is in this interval.

(c) We can test the hypotheses  $H_0: \mu_1 - \mu_2 = 0$  vs.  $H_A: \mu_1 - \mu_2 \neq 0$ . Since 0 is in the 95% confidence interval for  $\mu_1 - \mu_2$ , we do not reject  $H_0$ . That is we do not have significant evidence at the 5% level that there is a difference between mean VOT for children and adults.

(d) Many tests run at once will probably produce some “significant” results by chance alone even if the null hypotheses are true. (See p. 592 of your text)