

**Exercise 4D.1**

A test of the null hypothesis  $H_0 : \mu = \mu_0$  gives test statistic  $z = -2.12$ .

(a) What is the p-value if the alternative is  $H_a : \mu \neq \mu_0$ ?

(b) What is the p-value if the alternative is  $H_a : \mu < \mu_0$ ?

(c) What is the p-value if the alternative is  $H_a : \mu > \mu_0$ ?

### Exercise 4D.2

The p-value for a two-sided significance test of  $H_0 : \mu = 9$  is 0.082.

- (a) Do you reject the null hypothesis at level  $\alpha = 0.05$ ?
  
  
  
  
  
  
  
  
  
  
- (b) Do you reject the null hypothesis at level  $\alpha = 0.1$ ?
  
  
  
  
  
  
  
  
  
  
- (c) Would a 95% confidence interval for  $\mu$  contain 9? Why?
  
  
  
  
  
  
  
  
  
  
- (d) Would a 90% confidence interval for  $\mu$  contain 9? Why?

### Exercise 4D.3

For each of the following scenarios, state whether a type I error, a type II error, or no error will be made. Assume all tests are two-sided at the  $\alpha = 0.05$  level.

(a) A test of  $H_0 : \mu = 10$  produces a p-value = 0.31 and the true population mean is 14.

(b) A test of  $H_0 : \mu = 6$  produces a p-value = 0.02, and the true population mean is 10.

(c) A test of  $H_0 : \mu = 12$  produces a p-value = 0.005 and the true population mean is 12.