For the following hypotheses and observed data, calculate the t-statistic and pvalue. Throughout μ is the population mean.

1. $H_0 : \mu = 0$ vs $H_a : \mu \neq 0$ with $n = 13$, $\overline{x} = 4.94$, and $s = 10$.

   Answer:

   $$t = \frac{4.94 - 0}{10/sqrt13} = 1.781$$

   since $H_a : \mu \neq 0$, we have

   $$p\text{-value} = 2P(T_{12} > |1.781|) \approx 2 \cdot 0.05 = 0.1$$

2. $H_0 : \mu = 7$ vs $H_a : \mu < 7$ with $n = 24$, $\overline{x} = 4.08$, and $s = 5.98$.

   Answer:

   $$t = \frac{4.08 - 7}{5.98/sqrt24} = -3.487$$

   since $H_a : \mu < 7$, we have

   $$p\text{-value} = P(T_{23} > |-3.487|) \approx 0.001$$

3. $H_0 : \mu \leq -3$ vs $H_a : \mu > -3$ with $n = 51$, $\overline{x} = -1.63$, and $s = 9.34$.

   Answer:

   $$t = \frac{1.63 - (-3)}{9.34/sqrt(51)} = 1.047$$

   since $H_a : \mu > -3$, we have

   $$p\text{-value} = P(T_{50} > 1.047) = 0.15$$