1. **Problem**
You are given the following hypotheses:

$$H_0: \quad \mu = 12$$

$$H_A: \quad \mu < 12$$

We know that the sample standard deviation is 0.205 and the sample size is 20. For what sample mean would the $p$-value be equal to 0.005? Assume that all conditions necessary for inference are satisfied.

**Solution**
Determine the degrees of freedom.

$$df = 19$$

From the $p$-value we find a $t$ score from the $t$ table. In this case, our $p$-value is a one-tail probability.

$$t = -2.86$$

We calculate the standard error.

$$SE = \frac{s}{\sqrt{n}} = \frac{0.205}{\sqrt{20}} = 0.0458$$

We calculate the sample mean that would give $p$-value $= 0.005$.

$$\bar{x} = \mu + t \cdot SE = 12 + (-2.86)(0.0458) = 11.9$$