1. For each of the following situation, specify the corresponding $t^*$-value. Feel free to sketch the curve of $t$-distribution.

(a) 90th percentile for $df = 24$
\[ t = 1.318 \]

(b) 2.5th percentile for $df = 12$
\[ t = -2.179 \]

(c) the $t^*$ values that bound the middle 60% with $df = 5$
\[ t = -0.92 \quad \text{and} \quad t = 0.92 \]

(d) the 99.75th percentile for $df = 46$
\[ t = 2.911 \]

2. You want to construct a 98% confidence interval for data based on a sample of size 15. Find the critical value $t^*$ for the construction of the CI.
\[ t^* = 2.624 \]

3. Find the critical value $t^*$ corresponding to the 95th percentile for each of the following $df$:
\[ df = 1: 6.314, \quad df = 5: 2.015, \quad df = 15: 1.753, \quad df = 40: 1.684, \quad df = 1000: 1.646 \]

What would be the value of $z^*$. How does $z^*$ compare to any of the $t^*$ values?
\[ z^* = 1.645, \quad z^* \text{ is smallest; in fact as } df \text{ increase the values of } t^* \text{ decrease and approach } z^* \]

4. In a test $H_0: \mu = 24$ vs. $H_a: \mu > 24$, the sample data (based on a sample of size 22) yielded a test statistic $t = 2.64$. Find the corresponding p-value.
\[ df = 21: \quad 0.005 < \text{p-value} \leq 0.01 \]

Note: $t = 2.64$ cannot be found in Table D, however we know the value is between 2.518 and 2.831 giving no bounds for our p-value.

5. In a test $H_0: \mu = 2$ vs. $H_a: \mu < 2$, the sample data (based on a sample of size 10) yielded a test statistic $t = -1.427$. Find the corresponding p-value.
\[ df = 9: \quad \text{look up } t = 1.427 \]
\[ 0.05 \leq \text{p-value} < 0.10 \]
6. In a test $H_0 : \mu = 15.9$ vs. $H_a : \mu \neq 15.9$, the sample data (based on a sample of size 55) yielded a test statistic $t = 3.31$. Find the corresponding $p$-value. $df = 54$. Look up $df = 50$ (always round down).

\[
2 \times 0.0005 \leq p\text{-value} \leq 2 \times 0.001
\]

\[
0.001 \leq p\text{-value} \leq 0.002
\]

7. In a test $H_0 : \mu = 1.49$ vs. $H_a : \mu > 1.49$, the sample data (based on a sample of size 17) yielded a test statistic $t = 0.54$. Find the corresponding $p$-value.

$df = 16$

$t = 0.54$ is smaller than the smallest value in Table D for $df = 16$ ($t = 0.69$). Because $t = 0.69$ corresponds to a $p$-value of 0.25, we know the $p$-value for $t = 0.54$ must be even larger.

\[
p\text{-value} > 0.25
\]

Note: exact $p$-values can always be found using statistical software.