An approach to determining sample size for HW14

\[
P(\bar{X} > 43.448308 | \mu = 44) = \frac{\bar{X} - \mu}{s/\sqrt{n}} > \frac{43.448308 - 44}{2.7/\sqrt{100}} | \mu = 44 \\
= P(t > \frac{43.448308 - 44}{2.7/\sqrt{100}}) = -2.043303704 \\
= 0.978145
\]

This is from p. 4 of the handout. You want to find the n that gives you the smallest power which is still \( \geq 0.95 \). You already know that n=100 is probably a little too big because 0.978145 is a bit greater than 0.95. So play around with a smaller n in this equation:

\[
\bar{X} > 43 + 1.6604 \left( \frac{2.7}{\sqrt{100}} \right) = 43.448308
\]

Use an online t calculator to find the t value for a smaller n value. When you change the 100 to a smaller sample size, the value 1.6604 will change.

There are basically two systematic approaches. (1) Try an n value that you know is slightly too small and then increase n. Or, (2) you might start at 99 and then 98, etc., until you find the target power.

As an example of (1) using a t-calculator, I will use n=61 which I know is too small. If n=61 then degrees of freedom=60 and the t value for 0.05 is 1.671. This gives an x-bar rejection region of \( > 43.57766399 \). Using the first set of equations, we get a \( t = -1.221685 \). This yields a power of 0.8867. This means that n=61 is too small—which we knew. So, you may want to start somewhere around n=90. Just a guess. Your goal is to find the n that gives you the smallest power which is still \( \geq 0.95 \). If you started at n=90 and power is less than 0.95, then you increase to n=91. You stop when the power for your value of n is \( \geq 0.95 \).