More generally, suppose we test $H_0: \mu = \mu_0$ versus $H_A: \mu > \mu_0$ where σ is known at the α significance level. What is the power if the alternative is $\mu = \mu_1$ (Figure 8.4)?

If H_0 is true, then the sampling distribution of $\overline{X}$ is normal with mean μ_0 and standard error $\sigma/\sqrt{n}$. Let q denote the $1 - \alpha$ quantile for the standard normal. The corresponding critical value C for the sampling distribution of $\overline{X}$ is found by

$$\frac{C - \mu_0}{\sigma/\sqrt{n}} = q,$$

$$C = \mu_0 + q\frac{\sigma}{\sqrt{n}}.$$