Answer for 7.56 (pg. 258)

7.56. $H_0 : \mu = \mu_0 = 200$, $H_1 : \mu \neq 200$.
$\sigma = 20$, $n = 8$, $\alpha = 0.05$. Note use normal test.
Type II error is

$$\begin{aligned}
\beta(\mu) &= P\{\text{accepting } H_0 \text{ when } H_1 \text{ is true}\} \\
&= P\{-z_{\alpha/2} < \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}} < z_{\alpha/2}\} \\
&= P\{-z_{\alpha/2} + \frac{\mu_0 - \mu}{\sigma/\sqrt{n}} < \frac{\bar{X} - \mu}{\sigma/\sqrt{n}} < z_{\alpha/2} + \frac{\mu_0 - \mu}{\sigma/\sqrt{n}}\} \\
&= F(z_{\alpha/2} + \frac{\mu_0 - \mu}{\sigma/\sqrt{n}}) - F(-z_{\alpha/2} + \frac{\mu_0 - \mu}{\sigma/\sqrt{n}}) \\
&= F(1.96 + \frac{200 - \mu}{20/\sqrt{8}}) - F(-1.96 + \frac{200 - \mu}{20/\sqrt{8}})
\end{aligned}$$

$\beta(190) = 0.7$.