c. Case when $\pi_1 < \pi_0$?
   i. The test will now be of the form: Reject when $X \leq c$.
   ii. The same reasoning tells us that the c.r. has the same form regardless of which $\pi_1$ we consider.
   iii. Hence the test: Reject when $Q \leq c$ is uniformly most powerful for testing $H_0 : \pi = \pi_0$ vs. $H_A : \pi < \pi_0$.
   iv. Example: $X_1, \ldots, X_n \sim N(\mu, 1)$, independent
      - Test $H_0 : \mu = 0$ vs. $H_A : \mu = \mu_A$ for $\mu_A > 0$
      - Then
        \[
        \Lambda = \frac{\prod_{j=1}^n \exp(-X_j - \mu_A)^2/2}/\sqrt{2\pi} \\
        = \prod_{j=1}^n \exp(-X_j^2/2 + \mu_A X_j - n\mu_A^2/2) \\
        = \prod_{j=1}^n \exp(\mu_A X_j - n\mu_A^2/2) \\
        = \exp(\mu_A \sum_{j=1}^n X_j - n\mu_A^2/2) \\
        = \exp(n\mu_A \bar{X} - n\mu_A^2/2)
        \]
      - Hence reject $H_0$ if $\bar{X}$ large.
      - Critical value is $z_{\alpha}/\sqrt{n}$.
      - Compare with test based on median
        - Expectation still $\mu$
        - By Theorem 8.17, Variance

$\approx \phi(0)^{-2}/4(n-1) = \pi/(2(n-1))$

Sampling distribution approximately normal

Critical value $z_{\alpha}/\sqrt{\pi/(2(n-1))}$