The calculations in this case are very similar to the previous case.

Assuming that \( \sigma^2 \) is the true value of the variance, then \( \sigma_0^2 / \sigma^2 \) is a \( \chi^2(3) \), because there are four random variables involved with one constraint (a fixed mean \( \hat{\mu} \)), hence the three degrees of freedom. Similarly, \( \sigma_1^2 / \sigma^2 \) is a \( \chi^2(2) \), because of the two constraints \( \hat{\mu}_x, \hat{\mu}_y \). This means that

\[
\sqrt{\frac{L_1}{L_0}} \sim F(3, 2).
\]