Suppose that we are testing the following hypotheses about the means of two populations at the α level of significance based on n observations in each sample:

$$H_0 : \mu_1 - \mu_2 = 0$$

$$H_1 : \mu_1 - \mu_2 = \delta \quad (\delta > 0)$$

Assuming that $\sigma_1 \neq \sigma_2$ are known, derive the formula relating the sample size needed ($n = n_1 = n_2$) for a given power as a function of $z_\alpha, z_\beta, \sigma_1, \sigma_2, \text{ and } \delta$. Show the steps of your derivation, which should be similar to the one from class for testing a single population mean.

Hint: Start with the first 3 steps for computing power, keeping your derivation within the appropriate probability statements. Consider using a single constant (e.g., "a" or "$\bar{D}_\alpha$") to represent the RR in terms of the original units $\left(\bar{X}_1 - \bar{X}_2 \right)$ -- we used $\bar{X}_\alpha$ to represent the RR in the original units for the one-sample case.