1. In many areas of application people are interested in the variability of data relative to the mean. The usual statistic for expressing this idea is the *coefficient of variation* or CV: the size of the standard deviation relative to the mean, or σ/μ. You will often see the CV expressed as a percentage, that is if $\sigma/\mu = .05$, the CV may be expressed as 5%.

   (a) Generate 100 samples of size 25 from a Normal$(10, 1)$ distribution and find the CV for each sample as follows:

   ```
   set.seed(12345)
   X <- matrix(rnorm(100*25,10),nrow=100)
   m <- apply(X,1,mean)
   s <- apply(X,1,sd)
   CV <- s/m
   ```

   Compute the mean and standard deviation of the set of 100 CV's. Note: here the true CV is 1/10.

   (b) Using the 'Delta Method', find an expression for the approximate standard error of the CV. Since know the distribution of both the sample mean $\bar{x}$ and sample SD s^2, we can apply the method to

   $$\frac{\sqrt{s^2}}{\bar{x}}.$$

   (c) Write an R function to evaluate your formula for the SE of the CV. It should take the raw dataset as input.

   (d) Apply that function to the samples generated above, that is

   ```
   SE <- apply(X,1,yourfun)
   ```

   How do the Delta Method SE's compare to the standard deviation of the 100 CV's computed in the first part?