1. Let $S^2$ denote the sample variance of a sample of size 10 with distribution $N(\mu, \sigma)$, with $\sigma > 0$. What is the probability that the random interval $(S^2/1.9, S^2/0.27)$ contains $\sigma^2$?

2. Let a sample of size 17 with distribution $N(\mu, \sigma)$ be observed once, and suppose its sample mean is $\bar{x} = 4.7$ and sample variance is $s^2 = 5.76$. Determine a 90% confidence interval for $\mu$.

3. Let two random samples, each of size 10, from two independent normal distributions $N(\mu_1, \sigma^2)$ and $N(\mu_2, \sigma^2)$ be observed, giving sample means $\bar{x} = 4.8$ and $\bar{y} = 5.6$ and sample variances $s_1^2 = 8.64$ and $s_2^2 = 7.88$. Find a 95% confidence interval for $\mu_2 - \mu_1$.

4. (solo problem) Let a sample of size 25 with distribution $\text{Gamma}(4, 1/\theta)$ have sample mean $\bar{X}$. In terms of this sample mean, determine an approximate 95% confidence interval for $E(X_i)$, which equals $4/\theta$. (Hint: first determine a confidence interval for $\theta$, and then transform that as need be.)