BME 200
HW7

Follow the homework guidelines on the course webpage to answer the following.

1. Hutchinson-Gilford progeria syndrome (HGPS) is an extremely rare genetic disorder that causes children to age prematurely. The disease affects an estimated one in 18 million people. Assume that you have developed a test for newborns that is 99% accurate (for both patients with and without the disease). What is the chance that a patient with a positive test result for HGPS actually has it?

2. Assume the probability of having the seasonal flu is 10%. Assume that you have a test that is 99% accurate (for both patients with and without the disease). What is the chance that a patient with a positive test result for the flu actually has it?

3. You are in charge of the production line at a company that makes coronary stents. As production engineer, you have measured all of the stent lengths for an entire production run and know the population average is $\mu = 23.7$ mm and standard deviation is $\sigma = 0.95$ mm. Assume a Gaussian distribution.

   a. Find the probability that a randomly chosen stent has a length of (1) less than 20 mm, (2) between 21 and 22 mm, (3) between 21 and 25 mm, and (4) greater than 25 mm.
   b. Find the following percentiles for stent length: (1) 1st, (2) 10th, (3) 50th, and (4) 95th.

4. A biomedical engineer is developing a new process for purifying an antibody and is trying to decide if the new process should replace the current process. The current process has an impurity level of $\mu_0 = 2.3$, but the engineer would like for this impurity level to be lower. The engineer finds that from $n = 21$ samples, the new process has an average impurity level of 1.9 with a standard deviation of 0.8. The engineer wants only a 1% chance of incorrectly adopting the new process. Should the engineer adopt the new process?