

- 1 (15 points) BOB makes his living writing answers for the back of mathematics textbooks. Unfortunately, BOB is not terribly careful, so each of his answers is correct only 90% of the time. One particular section has 20 problems that BOB must solve for the answer section. Find the probability that BOB gets at least 18 of these answers correct.
- 2 (25 points) It is well known that the measure of Intelligence Quotient (IQ) has a normal distribution among the general population. The mean IQ for the general population is $\mu = 100$ and the standard deviation is $\sigma = 16$.
- (a) (15 points) What percentage of the population has an IQ score between 84 and 132?
- (b) (10 points) Mensa is an international society whose membership is limited to persons having IQs above the general population's 98th percentile (that is, people with IQ scores in the top two percent). What is the lowest IQ score that will qualify a person to belong to Mensa?
- 3 (21 points) Dr. Patty O'Furniture's patients must really like her. From the time they arrive at her office, they expect to wait 90 minutes before being taken in for their appointment! Assume that patient wait time (measured from arrival in the office) is an exponentially distributed random variable. Dr. O'Furniture would like to post a sign in her waiting room informing her patients of the likelihood of various waiting times. To assist her, please find the following probabilities:
- (a) (7 points) The probability that a patient will wait more than three hours.
- (b) (7 points) The probability that a patient will wait less than 45 minutes.
- (c) (7 points) The probability that a patient will wait between 45 and 180 minutes.

You may find these probabilities in any order you wish, but please label your solutions clearly.

- 4 (24 points) Suppose $f(x) = \frac{k}{x^3}$ for $x \geq 1$.
- (a) (12 points) Find k so that $f(x)$ is a probability density function over the interval $[1, \infty)$ (or, if you prefer, $x \geq 1$).
- (b) (12 points) Suppose X is a random variable with probability density function $f(x)$ (as given in part (a)). Find $E(X)$, the expected value of X .

- 5 (15 points)
- (a) (8 points) Find the *mean, median, variance* and *standard deviation* of the following data:

$$S_1 = \{ -3, 1, 3, 9, 10 \}.$$

Show enough of the details of your computations so that another person can follow them.

- (b) (7 points) Suppose the data set

$$S_2 = \{ -1, 3, x, y, z \}$$

has mean zero, median zero, and variance $\sigma^2 = 6$. Find x , y , and z .