1) Given the function

$$f(x) = \begin{cases} k\left(1 - x^2\right) & for\ 0 < x < 1 \\ 0 & otherwise \end{cases}$$

i) Find the value of *k* that will make *f(x)* a probability density.
ii) What is the probability that *X* lies between 0.2 and 0.4?
iii) Find the 90th percentile.

2) If *Z* is a standard normal random variable,
i) Find $z_{0.1}$, $z_{0.01}$, $z_{0.001}$, $-z_{0.05}$
ii) Find *z* such that $P(Z>z) = 0.9911$, *z* such that $P(Z<z) = 0.6443$

3) The burning time of a rocket is a random variable having a normal distribution with mean 4.76 seconds and a standard deviation 0.04 seconds.
a) Find the probability that the rocket will burn in
i) less than 4.6 seconds;
ii) more than 4.75 seconds;
iii) between 4.62 and 4.80 seconds
b) Find the 75th percentile and interpret it.

4) A wire bonding process is said to be in control if the mean pull strength is 10 pounds. It is known that the pull strength measurements are normally distributed with a standard deviation of 1.5 pound. Periodic samples of size 8 are taken from this process and the process is said to be out of control if the sample mean is less than 7.75. What is the probability that the wire bonding process is out of control?

5) Hard disks for computers must spin evenly, and one departure from level is called a roll. The roll for any disk can be modeled as a random variable having mean 0.2250 mm and standard deviation 0.0042 mm. The sample mean roll will be obtained from a random sample of 40 disks. What is the probability that the sample mean lies between 0.2240 and 0.2255?

6) An electronics store knows that 2% of a certain product sold require repair within a year. What is the probability that among 1000 of that product, at least 50 will require repair within a year of sale?

7) Refer to the example on page 140, and consider the density function modeled. Find the probability that
    i) The time to observe a particle is more than 100 microseconds,
    ii) The time to observe a particle is less than 20 microseconds.