Name: _____　　　　　　　Group _____

1) Let X be a continuous random variable with density

$$f_X(x) = \begin{cases} \dfrac{2}{57}(3x+2) & 1 \le x \le 4 \\ 0 & else \end{cases}$$

a) Verify that this is a valid density.

b) Calculate $P(0 \le X \le 3)$ using the density

c) Determine the 60th percentile of $f_X(x)$ using the density.

d) Determine the CDF.

e) Determine the density from the CDF.

f) Graph the density and the CDF.

2)
a) Suppose a random variable X has a density give by:

$$f_X(x) = \begin{cases} kx^3 & 0 < x < 4 \\ 0 & else \end{cases}$$

Find k so that this is a valid density.

b) Suppose a random variable has the following density:

$$f_X(x) = \begin{cases} \dfrac{1}{2} & 0 < x < 1 \\ \dfrac{1}{6} & 1 \le x \le 4 \\ 0 & else \end{cases}$$

i) Graph the density

ii) Find the CDF

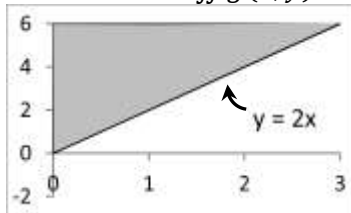iii) Graph the CDF

iv) What is the 60th percentile of $f_X(x)$?

3) Determine the answer for the following definite integrals:

a) $\int_{2}^{4} (2x^2 - 3)(6x + 2)dx$

b) $\int_{1}^{3} \int_{2}^{4} (2x - 3)(3y + 2)dxdy$ (see Chapter 25, p. 325)

c) $\int_{1}^{5} \int_{2}^{3} 10e^{-(3x+4y)}dydx$ (see Chapter 24, p. 321)

d) Integrate g(x,y) = x + y over the following area using both x and y as the outer integral, that is, calculate both $\iint g(x,y)dxdy$ and $\iint g(x,y)dydx$. (See Chapter 24, p. 324).

4. Identify from the information below whether X is a discrete or continuous random variable. Please explain your answer.

a) Let X be a random variable that takes values on the set {3, 4, 5, 6, 7}.

b) Let X be the number of defective light bulbs in a shipment.

c) Let X be the weight of a randomly selected child.

5. If you know $P(X \leq 5) = 0.9$, fill in the chart for the other values you know. Write "???" if there is not enough information to figure out a value.

	X is discrete	X is continuous
P(X < 5)		
P(X > 5)		
P(X ≥ 5)		
P(X = 5)		

6. For the following function
$$f_X(x) = \begin{cases} kx^9(1-x)^2 & 0 < x < 1 \\ 0 & else \end{cases}$$
a) What value of k makes this a valid density?

b) Calculate $P(X > 0.6)$.

7. Suppose that X has CDF

$$F_X(x) = \begin{cases} 0 & if\ x < 3 \\ \dfrac{1}{171}(x^3 - 6x - 9) & if\ 3 \le x \le 6 \\ 1 & if\ 6 < x \end{cases}$$

a) Find the density, $f_X(x)$.

b) Calculate P(X < 5).

8. Suppose a random variable X has the following density

$$f_X(x) = \begin{cases} \dfrac{7x}{4} & 0 \le x \le 1 \\ \dfrac{1}{8} & 7 \le x \le 8 \\ 0 & else \end{cases}$$

a) Find the CDF.

b) Find the median.

10. Let X be the waiting time (in minutes) until a student's friend arrives. Suppose that X has density

$$f_X(x) = \begin{cases} \dfrac{1}{3}e^{-x/3} & 0 < x \\ 0 & else \end{cases}$$

a) Find P(3 ≤ X ≤ 6).

b) Find the CDF F_X(x).

c) Find P(X ≥ 24). Calculate this using the density and the CDF.

d) Find P(X ≤ -3).

e) Find the 25th percentile.

f) Graph the density f_X(x).

g) Graph the CDF, F_X(x).