Lab 7 Solutions

Tutorial 6

6. *Q3.4-2*

```
> with(Statistics):
> X:=RandomVariable(Gamma(4,2));
> Probability(X<5);
```

8.
```
> X:=RandomVariable(ChiSquare(2));
> Percentile(X, 5);  #the value of a
> Percentile(X,95);  #the value of b
```

Tutorial 7

1. *Q3.5-1.*

```
> f:=piecewise(x<=0,0,x<1,4*x^3,0);
> f:=unapply(f,x);   #turn f into a function f(x).
> X:=RandomVariable(Distribution(PDF=f));
> Y:=X^2;
> PDF(Y,y);
> simplify(%)   #simplify the result obtained from the previous command.
```

2. *Q3.5-10.*

```
> X:=RandomVariable(Uniform(-1,3));
> Y:=X^2;
> PDF(Y,y);
> simplify(%);
> CDF(Y,y);
```

4. *Q4.1-1.*

```
> f:=(x+y)/32;
> f:=unapply(f,x,y);    #f is a bivariate function of x and y.
> sum(f(x,y),y=1..4);
> sum(f(x,y),x=1..2);
> f(2,1);
> f(1,2)+f(2,4)
> f(1,2)+f(2,1)
> f(1,1)+f(1,2)+f(2,1)
> sum(sum(x*f(x,y), x=1..2), y=1..4)
> sum(sum((x+y)*f(x,y), x=1..2), y=1..4);
```

5. *Q4.1-5.*

```
> (1/0.15)*(int(int(1, y = 2..x+.1), x = 2..2.1)+int(int(1, y = x-.1..x+.1), x = 2.1..2.2)
    +int(int(1, y = x-.1..2.3), x = 2.2..2.4))  #or
> (1/0.15)*int(int(1, y=max(2,x-0.1)..min(2.3,x+0.1)), x=2..2.4);
```

One needs to draw a graph to identify the region of X and Y over which the integration is to be done. The value 0.15 is the total area of the support of (X, Y).

6. *Q4.1-9.*

```
> f:=2*exp(-x-y);
> int(f, y=x..infinity);   #marginal pdf of X
> int(f, x=0..y);           #marginal pdf of Y
> int(int(x*f, y=x..infinity), x=0..infinity);     # E(X)
> int(int(exp(-x-2*y)*f, y=x..infinity), x=0..infinity);   # E[exp(-X-2Y)]
> int(int(f, x=1/2 .. y), y=1/2 .. infinity);      # P(X>1/2)
> simplify(%);
> int(int(f, x=1/2 .. y), y=2..infinity);   #P(X>1/2,  Y>2)
```