

EXERCISE 3.68 in Hsu ' s book

First calculate the marginal PDF ' s of X and Y according to formulas 3.30 - 3.31

```
In[1]:= Clear[fX, fY, fXY]; fXY[x_, y_] := Exp[-(2/3) * (x^2 - x*y + y^2)] / (Sqrt[3] * Pi);  
fX[x_] := Integrate[fXY[x, y], {y, -Infinity, Infinity}];  
fY[y_] := Integrate[fXY[x, y], {x, -Infinity, Infinity}];
```

Now calculate the asked for quantities in the exercise according to their definitions

```
In[2]:= Clear[EX, EY, VarX, VarY, EXY, rhoXY];  
EXY = Integrate[y * Integrate[x * fXY[x, y], {x, -Infinity, Infinity}],  
  {y, -Infinity, Infinity}];  
{EX, EY, VarX, VarY, rhoXY} = {Integrate[x * fX[x], {x, -Infinity, Infinity}],  
  Integrate[y * fY[y], {y, -Infinity, Infinity}],  
  Integrate[x^2 * fX[x], {x, -Infinity, Infinity}] - EX^2,  
  Integrate[y^2 * fY[y], {y, -Infinity, Infinity}] - EY^2,  
  (EXY - EX * EY) / (Sqrt[VarX * VarY])}
```

```
Out[2]= {0, 0, 1, 1,  $\frac{1}{2}$ }
```