1. A scatter plot was created for the first 1000 points of “x” and “y”.

Code:

```
N = 1000000;
x = rand(N,1);
n = randn(N,1);
y = 5*x+n;
figure(1)
scatter(x(1:1000,1),y(1:1000,1))
```

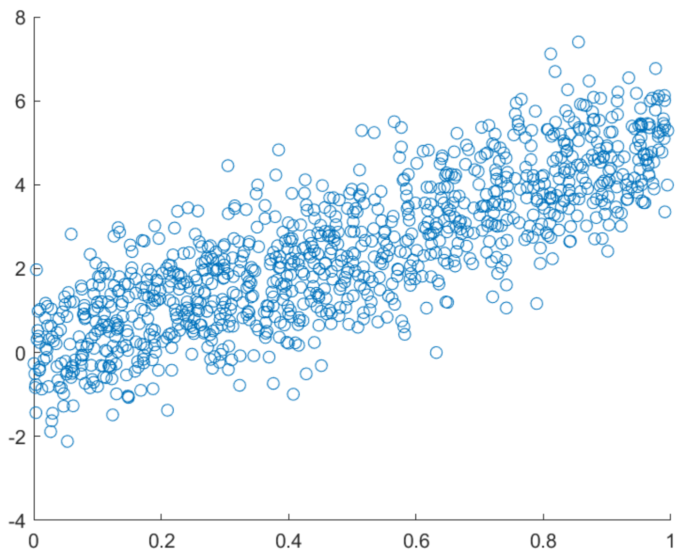

Figure 1: Scatter Plot

2. A 2D histogram was generated using hist3.

Code:

```
xc = [-0.2:0.025:1.2];
yc = [-6.5:0.2:10];
fxy = hist3([x y],{xc yc});
figure(2)
mesh(xc,yc,fxy')
xlabel('x')
ylabel('y')
```

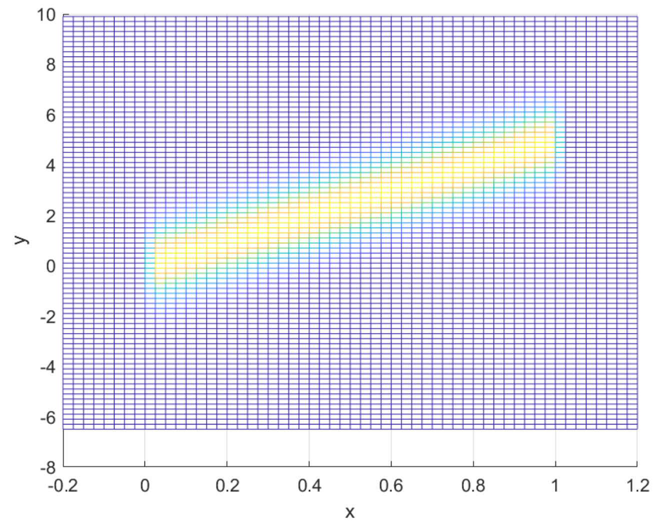

Figure 2: 2D Histogram

3. Based on the plot, what is the approximate most likely value of x if y = 1? y = 4? y = -2?

y-value	x-value
1	0.125
4	0.625
-2	0

4. E[XY] was estimated by using the formula below. The answer should be equivalent to 5/3.

$$\frac{1}{N}\sum_{i=1}^{N} x_i y_i$$

Code:

```
summation = (1:N);
for i = (1:N)
      summation(i) = x(i)*y(i);
end
answer = sum(summation)/N

answer =

    1.6654
```

Note: This is approximately 5/3

5. The shape of the marginal density functions of "x" and "y" were estimated, multiplied, and plotted. This plot is straighter than that of part 2. It looks more like a typical Gaussian and makes estimating the x values to be more precise.

Code:

```
fx = hist(x,xc);
fy = hist(y,yc);
figure(3)
mesh(xc,yc,fy'*fx)
```

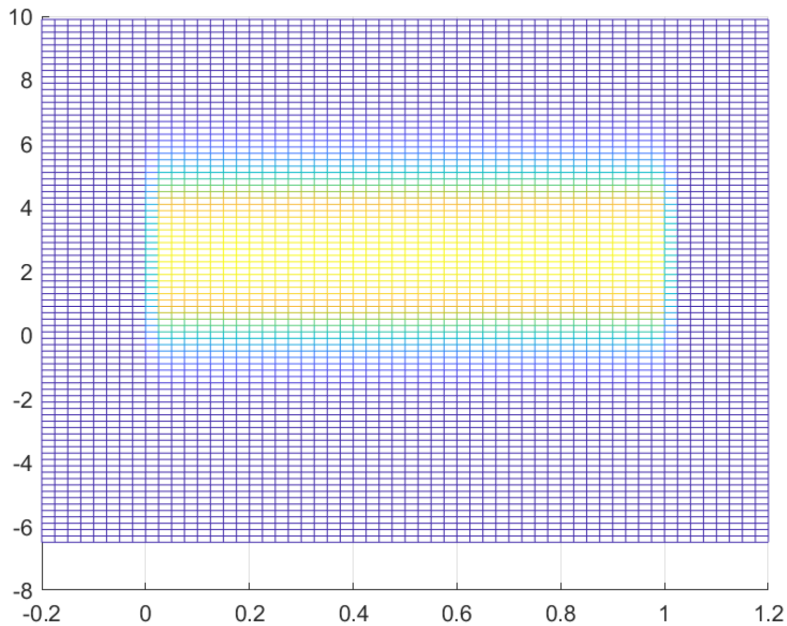

Figure 3: 2D Histogram Marginal Density Functions

X and Y are independent of each other. The y value remains the same regardless of the value of x. This contrasts with the graph from part 2 where the values are dependent on one another and vary with each value.