Quarto Test Document

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Chapter 1

Quarto

Quarto enables you to weave together content and executable code into a finished document. To learn more about Quarto see https://quarto.org.

Chapter 2

Running Code

When you click the **Render** button a document will be generated that includes both content and the output of embedded code. You can embed code like this:

```
1 + 1
```

```
2
```

Multiple line code

You can add options to executable code like this

```
4
```

It looks like you've shared a handwritten solution to a probability problem involving joint and marginal distributions, as well as checking for independence between two random variables $X) and $Y). Let's go over the main parts of the solution provided.

1. **Problem Statement**:
   - You're given a joint probability density function $f(x, y) = 6xy(2 - x - y)$ for $0 \leq x \leq 1$ and $0 \leq y \leq 1$.
2. **Part (i) - Finding $f_X(x)$**:
   - The goal here is to find the marginal distribution of X, $f_X(x)$, by integrating out y:

$$f_X(x) = \int_0^1 6xy(2 - x - y)\, dy$$

   - It looks like you've correctly set up the integration and simplified it to reach $f_X(x) = 4x - 6x^2$.
3. **Part (ii) - Finding $f_Y(y)$**:
   - Similarly, here you're finding the marginal distribution of Y, $f_Y(y)$, by integrating out x:

$$f_Y(y) = \int_0^1 6xy(2 - x - y)\, dx$$

   - After simplifying, you reached $f_Y(y) = 4y - 3y^2$, which appears to be correct based on the work shown.
4. **Part (iii) - Checking Independence**:
   - To check if X and Y are independent, you need to verify if $f(x, y) = f_X(x) \cdot f_Y(y)$ for all x and y.
   - Based on your calculations, $f(x, y) \neq f_X(x) \cdot f_Y(y)$, so you correctly concluded that X and Y are not independent.
5. **Part (iv) - Conditional Probability $f_{X|Y}(x|y)$**:
   - Here, you're asked to find the conditional probability distribution of X given $Y = y$.
   - You used the formula:

$$f_{X|Y}(x|y) = \frac{f(x, y)}{f_Y(y)}$$

   - After substituting and simplifying, you reached the final expres-

sion:

$$f_{X|Y}(x|y) = \frac{6x(2-x-y)}{4y-3y^2}$$

Your calculations seem consistent with the steps for solving this type of problem. If you have any specific questions on these steps or need clarification on a particular part, feel free to ask!