Probability Theory: Activity 17 Name: _____

1. Let X and Y be continuous random variables with the following joint PF:

$$f(x,y) = \begin{cases} 12x^2 & \text{for } 0 \leq x \leq y \leq 1 \\ 0 & \text{otherwise.} \end{cases}$$

   (a) Find the marginal distribution of X.

   (b) Find the conditional distribution $f_{Y|X}(y|x)$.

   (c) Find $E(Y|X)$.

(d) Let $g(x) = E(Y|X)$. Find $E(g(x))$.

(e) The marginal distribution of Y is:

$$f_Y(y) = \begin{cases} 4y^3 & \text{for } 0 < x < 1 \\ 0 & \text{otherwise.} \end{cases}$$

Find $E(Y)$.