

M2S1 - ASSESSED COURSEWORK 2

To be handed in no later than Friday, 22nd November

For this coursework, MAPLE may NOT be used.

- (a) The joint pdf for continuous random variables X and Y with ranges $\mathbb{X} \equiv \mathbb{Y} \equiv \mathbb{R}^+$ is given by

$$f_{X,Y}(x,y) = c_1(x+2y)\exp\{-(x+y)\} \quad x,y > 0$$

and zero otherwise for some constant c_1 .

- (i) Find the value of c_1

[2 MARKS]

- (ii) Find the marginal pdfs of X and Y , f_X and f_Y

[4 MARKS]

- (iii) Find the probability

$$P[Y > X]$$

[2 MARKS]

- (b) The joint pdf for continuous random variables X, Y and Z with ranges $\mathbb{X} \equiv \mathbb{Y} \equiv \mathbb{Z} \equiv (0, 1)$ is given by

$$f_{X,Y,Z}(x,y,z) = c_2xyz \quad 0 < x,y,z < 1$$

and zero otherwise for some constant c_2 .

- (i) Find the value of c_2

[2 MARKS]

- (ii) Find the probability

$$P[X > Y]$$

[3 MARKS]

- (iii) Find the probability

$$P[Y > Z]$$

[1 MARK]

- (c) The joint pdf for continuous random variables X and Y is given by

$$f_{X,Y}(x,y) = c_3 \exp\{-2x-y\} \quad 0 < x < y < \infty$$

and zero otherwise for some constant c_3 .

- (i) Find the marginal pdfs of X and Y , f_X and f_Y (with normalizing constants explicitly stated)

[4 MARKS]

- (ii) Are X and Y independent random variables? Justify your answer.

[2 MARKS]

NOTE: WHEN REPORTING A PDF, YOU SHOULD STATE EXPLICITLY THE REGION OF \mathbb{R} (OR \mathbb{R}^k) ON WHICH THE FUNCTION IS POSITIVE.