

**MAU11S02 seventh Monday quiz, week 10**  
**Monday 28/3/22 due 12 noon Thursday 31/3/22**

**Rules and procedures.**

**1.** Attempt 3 questions. Only *your first three answers* will be marked. **2.** Each question carries 20 marks, so the maximum quiz mark is 60. **3.** If a particular method of solution is stipulated, you get no marks if you don't use it. **4. *Show all work.*** No marks will be given for answers which do not show the calculations. **5.** Your answers should be scanned and submitted to Blackboard as a 'Monday assignment.'

**Question 1.** Given independent random variables  $X_1 \sim B(3, 1/2)$  and  $X_2 \sim B(3, 2/3)$ , calculate the probabilities  $X_1 = x_1$  and  $X_2 = x_2$ ,  $0 \leq x_1 \leq 3, 0 \leq x_2 \leq 3$  (not 5, small correction).

**Question 2.** Calculate the probability distribution of the random variable  $X_1 + X_2$ .

**Question 3.** Here is the graph of a continuous distribution, which a random variable  $X$  follows. (i) What is  $b$ ? (ii) Given  $a = 2$ , evaluate  $E(X)$ .

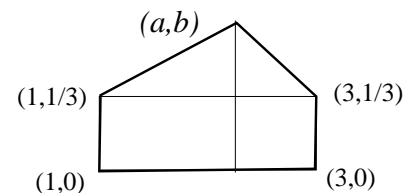


Figure 1: Question 3

**Question 4.** Suppose  $X \sim N(1, 4)$ . Evaluate the following ( $P$  means probability). (i)  $P(X \leq 3)$ . (ii)  $P(1 < X < 3)$ . (iii)  $P(X \geq 2)$ . (iv)  $P(-3 \leq X \leq -2)$ . (v)  $P((-3 \leq X \leq -2) \& (X \neq -3))$ .

**Question 5.** Here is a distribution with infinite discrete sample space 'parametrised' by  $\alpha$ , where  $0 < \alpha < 1$ . Evaluate  $E(X)$ , the mean of the distribution.

$$p_i = (1 - \alpha)\alpha^{i-1}, \quad i = 1, 2, \dots$$

Hint: evaluate  $\frac{d}{d\alpha} \frac{1}{1-\alpha}$ .