MAU11S02 seventh Friday quiz, week 10
Friday 1/4/22 due 4pm Monday 4/4/22

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 'Friday assignment.'

Question 1. Given independent random variables $X_1 \sim B(3, 1/2)$ and $X_2 \sim B(3, 3/5)$, calculate the probabilities $X_1 = x_1$ and $X_2 = x_2$, $0 \leq x_1 \leq 3, 0 \leq x_2 \leq 3$.

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

Question 3. Here is the graph of a continuous distribution, whose pdf is formed of two quadratic curves, crossing the x-axis at -1 and 2 respectively, and with a common horizontal tangent at $(0, h)$.

(i) What is h? (ii) Calculate the mean of the distribution.

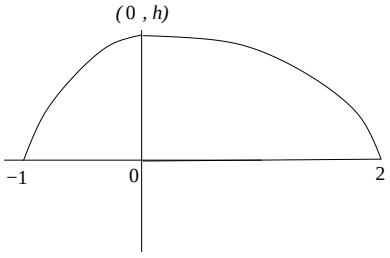

Figure 1: Question 3

Question 4. Suppose $X \sim N(2, 9)$. 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 α, where $0 < \alpha < 1$. Evaluate $E(X)$, the mean of the distribution.

$$p_i = (1 - \alpha)\alpha^{i-1}, \qquad i = 1, 2, \ldots$$

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