

**MATH48181/68181: EXTREME VALUES AND FINANCIAL RISK**  
**SEMESTER 1**  
**QUIZ PROBLEM 8**  
(Deadline: 11:00am on Wednesday, 8 December 2021)

Suppose  $X$  represents loss and has the following probability density function

$$f_X(x) = \begin{cases} \frac{abx^{b-1}}{\delta^b(a+b)}, & \text{if } x \leq \delta, \\ \frac{ab\delta^a}{x^{a+1}(a+b)}, & \text{if } x > \delta \end{cases}$$

for  $x > 0$ ,  $a > 0$ ,  $b > 0$  and  $\delta > 0$ . Derive an explicit expression for  $\text{ES}_p(X)$ . Please give full details.

**This problem is worth 1 mark. Marking scheme: 1 mark if the answer is correct, and the derivation is correct and detailed enough; 0.5 mark if the answer is correct, and the derivation is incorrect or not detailed enough; 0.5 mark if the answer is incorrect or not given, but the derivation is correct and detailed enough; 0 mark if the answer is correct, but the derivation is not detailed enough; 0 mark if the answer is incorrect, and the derivation is not detailed enough.**

Please use Blackboard to submit your answer.