MATH4/68181: Extreme values and financial risk
Semester 1
Problem sheet for Week 6 and Week 7

Suppose X is a random variable representing a financial loss. Find expressions for Value at Risk and Expected Shortfall if X has the following distributions:

1. the exponential distribution given by the cdf $F(x) = 1 - \exp(-\lambda x)$, $x > 0$.
2. the power function distribution given by the cdf $F(x) = x^a$, $0 < x < 1$.
3. the uniform$[a, b]$ distribution.
4. the Pareto distribution given by the cdf $1 - (K/x)^a$, $x > K$.
5. the standard normal distribution.
6. the log-logistic distribution $\left[1 + (x/a)^{-b}\right]^{-1}$, $x > 0$.
7. the Lomax distribution given by the cdf $1 - \left(1 + \frac{x}{\lambda}\right)^{-\alpha}$, $x > 0$.
8. the Fréchet distribution given by the cdf $\exp\left\{-\left(\frac{\sigma}{x}\right)^{\alpha}\right\}$, $x > 0$.
9. the Weibull distribution given by the cdf $1 - \exp\left\{-\left(\frac{x}{\sigma}\right)^{\alpha}\right\}$, $x > 0$.
10. the generalized Pareto distribution given by the cdf $1 - \left(1 - \frac{cx}{k}\right)^{1/c}$, $x > 0$.
11. the Tukey Lambda distribution given by the quantile function $\frac{p^\lambda - (1-p)^\lambda}{\lambda}$.
12. the generalized Lambda distribution given by the quantile function $\frac{p^\beta - (1-p)^\gamma}{\delta}$.
13. Hankin and Lee's distribution given by the quantile function $\frac{Cp^\alpha}{(1-p)^\beta}$.