MATH4/68181: Extreme values and financial risk
Semester 1
Problem sheet 3

There are many financial indices that take the form of ratios. Some of the most commonly known examples are:

1. Current ratio defined by Current assets (X)/Current liabilities (Y).

2. Sales margin defined by (Sales (X) - Costs (Y))/Sales (X).

3. Changes in capital employed defined by (Closing capital (Y) - Opening capital (X))/Opening capital (X).

4. Interest cover defined by (Earnings (X) + Interests paid (Y))/Earnings (X).

5. Liabilities ratio defined by Liabilities (X)/(Equity (Y) + Liabilities (X)).

6. Financial leverage ratio defined by Liabilities (X)/(Total capital (Y) - Liabilities (X)).

Derive the cdf and pdf of each of the mentioned ratios by assuming that X and Y independent Pareto random variables with cdfs specified by

$$F_X(x) = 1 - (K/x)^a, \ x \geq K$$

and

$$F_Y(y) = 1 - (L/y)^b, \ y \geq L,$$

respectively, where $K > 0$, $L > 0$, $a > 0$ and $b > 0$.