a) Show that if (x_i) is a decreasing sequence of positive numbers then

$$\left(\sum_{i=1}^{n} x_i^2\right)^{1/2} \leq \sum_{i=1}^{n} \frac{x_i}{\sqrt{i}}.$$

b) Show that there is a constant C so that if (x_i) is a decreasing sequence of positive numbers then

$$\sum_{m=1}^{\infty} \frac{1}{\sqrt{m}} \left(\sum_{i=m}^{\infty} x_i^2\right)^{1/2} \leq C \sum_{i=1}^{\infty} x_i.$$