1. (*a*) For $|y| < 1$, write down the binomial series expansion of $(1 - y)^{-2}$ in ascending powers of y up to and including the term in y^3.

(1)

(*b*) Hence, or otherwise, show that

$$1 + \frac{2x}{1+x} + \frac{3x^2}{(1+x)^2} + \ldots + \frac{rx^{r-1}}{(1+x)^{r-1}} + \ldots$$

can be written in the form $(a + x)^n$. Write down the values of the integers a and n.

(4)

(*c*) Find the set of values of x for which the series in part (*b*) is convergent.

(3)