Simplify each of the following series.

1. If $f(x)=1+x+x^2+\cdots+x^n+\cdots=\sum_{n=0}^{\infty}x^n$ find the following

   a) $f(x^2)=$
   b) $f(x^3)=$
   c) $f(x^4)=$

2. If $f(x)=1-x+x^2-\cdots+(-x)^n+\cdots=\sum_{n=0}^{\infty}(-1)^n x^n$ find the following

   d) $f(x^2)=$
   e) $f(x^3)=$
   f) $f(x^4)=$

3. If $f(x)=1+x+\frac{x^2}{2!}+\cdots+\frac{x^n}{n!}+\cdots=\sum_{n=0}^{\infty}\frac{x^n}{n!}$ find the following

   g) $f(x^2)=$
   h) $f(x^3)=$
   i) $f(x^4)=$

4. If $f(x)=x-\frac{x^3}{3!}+\frac{x^5}{5!}-\cdots+(-1)^n\frac{x^{2n+1}}{(2n+1)!}+\cdots=\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n+1}}{(2n+1)!}$ find the following

   j) $f(x^2)=$
   k) $f(x^3)=$
   l) $f(x^4)=$

5. If $f(x)=1-\frac{x^2}{2!}+\frac{x^4}{4!}-\cdots+(-1)^n\frac{x^{2n}}{(2n)!}+\cdots=\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n}}{(2n)!}$

   m) $f(x^2)=$
   n) $f(x^3)=$
   o) $f(x^4)=$

6. If $f(x)=x-\frac{x^2}{2}+\frac{x^3}{3}-\cdots+(-1)^{n-1}\frac{x^n}{n}+\cdots=\sum_{n=0}^{\infty}(-1)^{n-1}\frac{x^n}{n}$

   p) $f(x^2)=$
   q) $f(x^3)=$
   r) $f(x^4)=$

7. If $f(x)=x-\frac{x^3}{3}+\frac{x^5}{5}-\cdots+(-1)^n\frac{x^{2n+1}}{2n+1}+\cdots=\sum_{n=0}^{\infty}(-1)^n\frac{x^{2n+1}}{2n+1}$

   s) $f(x^2)=$
   t) $f(x^3)=$
   u) $f(x^4)=$