8. [9 points] Consider the function $g(x)$ defined by the power series

$$g(x) = \sum_{n=0}^{\infty} \frac{2^n (n!)^2 x^n}{(2n)!}.$$

a. [6 points] Find the **radius** of convergence of the power series. You do not need to find the interval of convergence.

b. [3 points] Use the first 3 nonzero terms of the power series to estimate

$$\int_0^1 \frac{g(x) - 1}{x}\, dx.$$