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

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