

**Instruction:** Do not give me any paper. Just compute the numbers carefully and then email them to me.

You may find Stirling's formula useful for some of these problems. Here's one version

$$n! = \sqrt{2\pi n} n^n e^{-n} \exp\left(\frac{\delta_n}{12n}\right)$$

for some  $\delta_n$  with  $0 < \delta_n < 1$ .

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**Problem 1.** Find the radius of convergence of

$$\sum_{n=0}^{\infty} \frac{(n!)^2}{(2n)!} z^n$$

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**Problem 2.** Find the radius of convergence of

$$\sum_{n=0}^{\infty} n! z^{n!}$$

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**Problem 3.** Find the radius of convergence of

$$\sum_{n=0}^{\infty} \frac{n!}{n^n} z^{2n}$$

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**Problem 4.** Find the radius of convergence of

$$\sum_{n=0}^{\infty} n! z^n$$

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**Problem 5.** Find the radius of convergence of

$$\sum_{n=0}^{\infty} \left(1 + \frac{1}{n}\right)^{n^2} z^{3n}$$

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**Problem 6.** Find the radius of convergence of

$$\sum_{n=0}^{\infty} n^2 2^n z^{3n}$$