All curves are positively oriented unless otherwise noted.

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1. Find the radius of convergence of the power series

$$\sum_{n=0}^{\infty}(n+1)z^n$$

and to which function it converges.

2. Find the Taylor series of $\cos z$ around 0 differentiating termwise the Taylor series of $\sin z$.

3. Find the first 3 terms (3 smallest powers) of the Laurent series of

$$\frac{1}{e^z-1}$$

around 0. What is the annulus of convergence?

4. The function f is analytic in the domain $r<|z-z_0|<R$ and bounded there by M. If a_j, $j\in\mathbb{Z}$, are the coefficients of the Laurent series of f in that annulus show the inqualities

$$|a_j|\le\frac{M}{R^j},\quad |a_{-j}|\le Mr^j,\quad (j=0,1,2,\ldots).$$