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1*. Show that the functions

$$\sum_{k=1}^{\infty} \frac{z^k}{k^{3/2}}$$

and

$$\sum_{k=2}^{\infty} \frac{z^k}{\ln k}$$

are analytic in the unit circle. Show that $z = 1$ is a singular point for both, but it is not an isolated singularity.

2*. Both the residue formula and Rouché's theorem are essential to many applications of Complex Analysis. Please take some time to carefully work out problems 19, 20, 23, 26, 27, 28, 29, 34 and 37 at the end of VI §1 in the textbook. Turn in only problems 27 and 34.