Q1 Check whether following series are convergent or divergent

a) $\sum_{n=0}^{\infty} \frac{(100+75i)^n}{n!}$

b) $\sum_{n=0}^{\infty} a_n + b_n$ where $a_n = \frac{i}{2^{3n}}$ and $b_n = \frac{1}{2^{3n+1}}$

c) $\sum_{n=2}^{\infty} \frac{(-i)^n}{\ln n}$

d) $\sum_{n=0}^{\infty} \frac{(\pi+\pi i)^{2n+1}}{(2n+1)!}$

Q2 Find the center and radius of convergence

a) $\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!} \left(z-\frac{1}{2}\pi\right)^{2n}$

b) $\sum_{n=0}^{\infty} \left[1+(-1)^n+\frac{1}{2^n}\right] z^n$

c) $\sum_{n=0}^{\infty} \frac{n(n-1)}{3^n} (z-i)^{2n}$

d) $\sum_{n=0}^{\infty} \frac{(2n)!}{4^n (n!)^2} (z-2i)^n$

Q3 Find the Maclaurin series (Taylor series with center $z_0 = 0$) for following

a) $\sin z$

b) $\cos z$

c) $\frac{1}{1+z^2}$

d) $\arctan z$

Q4 Develop $\frac{1}{c-z}$ in powers of $z-z_0$, where $c-z_0 \neq 0$

Q5 Find the Taylor series with center z_0 & its radius of convergence

a) $f(z) = \frac{2z^2+9z+5}{z^3+z^2-8z-12}$, $z_0 = 1$

b) $f(z) = \sin z$, $z_0 = \pi/2$

c) $f(z) = \sinh(2z-i)$, $z_0 = i/2$

d) $f(z) = \frac{1}{(z+i)^2}$, $z_0 = i$