Q2: We first take note that

$$\frac{2}{(1-w)^3} = \frac{\partial^2}{\partial w^2}\frac{1}{1-w}$$

We can therefore have that

$$\frac{2}{(1-w)^3} = \frac{\partial^2}{\partial w^2} \cdot \sum_{n=0}^{\infty} w^n$$

Applying termwise differentiation, get that

$$\frac{2}{(1-w)^3} = \sum_{n=2}^{\infty} n(n-1)w^n$$

Substituting $w = z^2$, get that

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

We now multiply by z^2 and conclude that

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

Now using Hadamards Formula, we compute the radius of convergence as

$$\begin{aligned}
\frac{1}{R} &= \lim_{n\to\infty} \sup \sqrt[n]{\left|\frac{n(n-1)}{2}\right|} \\
&= \lim_{n\to\infty} \sup \sqrt[n]{n(n-1)} \cdot \lim_{n\to\infty} \sup \sqrt[n]{\frac{1}{2}} \\
&= 1
\end{aligned}$$

Hence this power series converges on $|z| < 1$ and diverges everywhere else.