Expand $f(z)=\dfrac{1}{z^2(1-z)}$ into Laurent series

(1) $0<|z|<1$

$$f(z)=\frac{1}{z^2}\cdot\frac{1}{1-z}=\frac{1}{z^2}\sum_{n=0}^{\infty}z^n=\sum_{n=0}^{\infty}z^{n-2}$$

(2) $1<|z|<\infty$

$$f(z)=\frac{1}{z^2}\cdot\frac{1}{1-z}=\frac{-1}{z^3}\cdot\frac{1}{1-\frac{1}{z}}=\frac{-1}{z^3}\sum_{n=0}^{\infty}(\frac{1}{z})^n=-\sum_{n=0}^{\infty}\frac{1}{z^{n+3}}$$