

$$\begin{aligned} \text{gd}(w) &= i(w - w^3/3! + 5*w^5/5! - 61*w^7/7! + \dots) = i\theta \\ \text{gd}(i\theta) &= i(i\theta - (i\theta)^3/3! + 5*(i\theta)^5/5! - 61*(i\theta)^7/7! + \dots) = -w \\ \text{gd}(-w) &= i(-w - (-w)^3/3! + 5*(-w)^5/5! - 61*(-w)^7/7! + \dots) = -i\theta \\ \text{gd}(-i\theta) &= w \end{aligned}$$