

80c

$$f_3(z) = \frac{\sin 2z}{(1+z)^3}$$

$$\text{Res}(f_3, -1) = \lim_{z \rightarrow -1} \frac{g''(z)}{2!} = \lim_{z \rightarrow -1} -2 \sin 2z = -2 \sin 2$$

$$= 2 \sin 2$$

$$g(z) = (1+z)^3 \cdot f_3(z) = \sin 2z$$

$$g'(z) = 2 \cos 2z$$

$$g''(z) = -4 \sin 2z$$