

1. We know that the PDF must integrate to 1. Therefore we have

$$\int_{-\infty}^{\infty} f_Z(z) dz = \int_{-2}^1 \gamma(1+z^2) = \gamma \left(z + \frac{1}{3}z^3 \right) \Big|_{-2}^1 = 6\gamma.$$

From this we conclude $\gamma = 1/6$.

2. To find the CDF, we integrate:

$$\begin{aligned} F_Z(z) &= \int_{-\infty}^z f_Z(t) dt = \begin{cases} 0, & \text{if } z < -2, \\ \frac{1}{6} (t + \frac{1}{3}t^3) \Big|_{-2}^z, & \text{if } -2 \leq z \leq 1, \\ 1, & \text{if } z > 1 \end{cases} \\ &= \begin{cases} 0, & \text{if } z < -2, \\ \frac{1}{6} (z + \frac{1}{3}z^3 + \frac{14}{3}), & \text{if } -2 \leq z \leq 1, \\ 1, & \text{if } z > 1. \end{cases} \end{aligned}$$