

On  $C_1$ :  $x = 2t \Rightarrow dx = 2dt$ ,  $y = t \Rightarrow dy = dt$ ,  $z = -t \Rightarrow dz = -dt$ ,  $0 \leq t \leq 1$ .

On  $C_2$ :  $x = 2 + t \Rightarrow dx = dt$ ,  $y = 1 \Rightarrow dy = 0dt$ ,  $z = -1 + t \Rightarrow dz = dt$ ,  $0 \leq t \leq 1$ .

$$\begin{aligned} & \int_C x^2 dx + y^2 dy + z^2 dz \\ &= \int_{C_1} x^2 dx + y^2 dy + z^2 dz + \int_{C_2} x^2 dx + y^2 dy + z^2 dz \\ &= \int_0^1 (2t)^2 \cdot 2 dt + (t)^2 \cdot dt + (-t)^2 (-dt) \\ &+ \int_0^1 (2+t)^2 \cdot dt + 1^2 \cdot 0 dt + (-1+t)^2 dt \\ &= \int_0^1 8t^2 dt + \int_0^1 (2t^2 + 2t + 5) dt = \left[ \frac{8}{3}t^3 \right]_0^1 + \left[ \frac{2}{3}t^3 + \frac{2}{2}t^2 + 5t \right]_0^1 = \frac{28}{3} \end{aligned}$$

