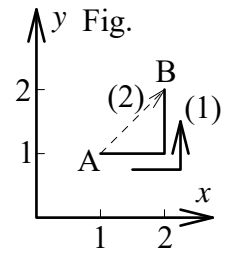


Please evaluate the integral $\int_C xy^3 ds$ where C is the segment of the line $y=2x$ in the x - y plane from $(-1, -2)$ to $(1, 2)$. [98 交大機械丙 4]



$$[\text{解}] \mathbf{r} = x\mathbf{i} + y\mathbf{j} \Rightarrow d\mathbf{r} = dx\mathbf{i} + dy\mathbf{j} = dx\mathbf{i} + 2dx\mathbf{j} \Rightarrow ds = |d\mathbf{r}| = \sqrt{(dx)^2 + (2dx)^2} = \sqrt{5}dx$$

$$\int_C xy^3 ds = \int_C x(2x)^3 \sqrt{5} dx = 8\sqrt{5} \int_{-1}^1 x^4 dx = 8\sqrt{5} \cdot \frac{x^5}{5} \Big|_{-1}^1 = \frac{16\sqrt{5}}{5}$$