$$\begin{aligned}\int_0^1 \left(4t^3\,\mathbf{i} - 12t^2\,\mathbf{j} + 20t^4\,\mathbf{k}\right) dt &= \left(\int_0^1 4t^3\,dt\right)\mathbf{i} - \left(\int_0^1 12t^2\,dt\right)\mathbf{j} + \left(\int_0^1 20t^4\,dt\right)\mathbf{k} \\ &= \left[t^4\right]_0^1\,\mathbf{i} - \left[4t^3\right]_0^1\,\mathbf{j} + \left[4t^5\right]_0^1\,\mathbf{k} = \mathbf{i} - 4\,\mathbf{j} + 4\,\mathbf{k}\end{aligned}$$