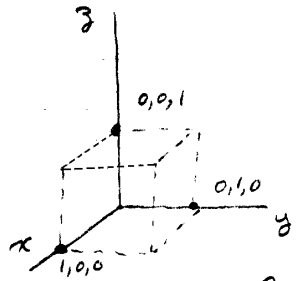
Base 6-10.2

$$\mathbf{V} = x^2\mathbf{i} + y^2\mathbf{j} + z^2\mathbf{k}$$

$$\int_\sigma \mathbf{V}\cdot\mathbf{n}\,d\sigma$$



Break up integral into 6 parts, one for each surface

For $\mathbf{n} = \pm\mathbf{k}$ $\quad \sigma_1 = 1$

$$\int_{\sigma_1} \mathbf{V}\cdot\mathbf{n}\,d\sigma = \int z^2\,d\sigma - \int z^2\,d\sigma = \int 1^2\,d\sigma - \int 0^2\,d_3 = \int_\sigma d\sigma = 1$$

For $\mathbf{n} = \pm\mathbf{j}$:

$$\int_{\sigma_2} \mathbf{V}\cdot\mathbf{n}\,d\sigma = \int y^2\,d\sigma - \int y^2\,d\sigma = \int 1^2\,d\sigma - \int 0^2\,d\sigma = \int d\sigma = 1$$

For $\mathbf{n} = \pm\mathbf{i}$

$$\int_{\sigma_3} \mathbf{V}\cdot\mathbf{n}\,d\sigma = \int x^2\,d\sigma - \int x^2\,d\sigma = \int 1^2\,d\sigma - 0 = 1$$

$$\int_\sigma \mathbf{V}\cdot\mathbf{n}\,d\sigma = \int_{\sigma_1} + \int_{\sigma_2} + \int_{\sigma_3}$$

$$\int_\sigma \mathbf{V}\cdot\mathbf{n}\,d\sigma = 3$$