$$G(v) = \int_0 v(x)\,dx$$

$$V = \sum_{i=1}^{n} c_i\, \varphi_i(x)$$

$$G(v) = \int_0 \sum_{i=1}^{n} c_i\, \varphi_i(x)\,dx$$

$$= \int_0 \sum_{i=1}^{n} c_i\, \varphi_i(x) \sum_{j=1}^{n} \varphi_j(x)\,dx$$

$$= \sum_{i,j} c_i \cdot 1 \cdot \underbrace{\int \varphi_i \varphi_j\,dx}_{= \mu_{ij}}$$

$$= 1^T M c$$