$$-\frac{d}{dx}\left(k(x)\,\frac{du(x)}{dx}\right)=100x^2 \qquad k(x)=\begin{cases}1, & x\in\langle 0,1\rangle\\ 2x, & x\in(1,2\rangle\end{cases}$$

$$u(2)=-20 \qquad \Omega=\langle 0,2\rangle$$

$$u'(0)+u(0)=20 \implies u'(0)=20-u(0)$$

$$-\left(k(x)\,u'(x)\right)'=100x^2 \;\Big|\cdot v(x),\; v\in V,\; V=\{f\in H^1 : f(2)=0\}$$

$$-\left(k(x)\,u'(x)\right)'v(x)=100x^2v(x) \;\Big|\int_\Omega dx$$

$$-\int_0^2\left(k(x)\,u'(x)\right)'v(x)\,dx=100\int_0^2 x^2v(x)\,dx$$

$$-\left(k(x)u'(x)v(x)\right)\Big|_0^2+\int_0^2 k(x)u'(x)v'(x)\,dx=100\int_0^2 x^2v(x)\,dx$$

$$-k(2)u'(2)\underbrace{v(2)}_{=0}+\underbrace{k(0)}_{=1}u'(0)v(0)+\int_0^2 k(x)u'(x)v'(x)\,dx=100\int_0^2 x^2v(x)\,dx$$

$$u'(0)v(0)=(20-u(0))v(0)=20v(0)-u(0)v(0)$$

$$20v(0)-u(0)v(0)+\int_0^2 k(x)u'(x)v'(x)\,dx=100\int_0^2 x^2v(x)\,dx$$

$$\underbrace{\int_0^2 k(x)u'(x)v'(x)\,dx-u(0)v(0)}_{B(u,v)}=\underbrace{100\int_0^2 x^2v(x)\,dx-20v(0)}_{L(v)}$$