$$-\frac{d}{dx}\left(k(x)\ \frac{du(x)}{dx}\right) = 100x$$

$$u(2)=0$$

$$\frac{du(0)}{dx} + u(0) = 20$$

$$\Omega = \langle 0,2\rangle \ni x \longmapsto u(x) \in \mathbb{R}$$

$$k(x) = \begin{cases} 1 & \text{dla} \quad x \in \langle 0,1\rangle \\ 2x & \text{dla} \quad x \in (1,2\rangle \end{cases}$$

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

$$-v(x)\left[k(x)u'(x)\right]' = 100x\,v(x) \quad \Big| \int_\Omega dx$$

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

$$\left|\begin{array}{ll} a = v(x) & a' = v'(x) \\ b' = \left[k(x)u'(x)\right]' & b = k(x)u'(x) \end{array}\right|$$

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

$$-\left(\overbrace{v(2)}^{0}k(2)u'(2) - v(0)\overbrace{k(0)}^{1}\overbrace{u'(0)}^{20-u(0)} - \int_0^2 k(x)v'(x)u'(x)dx\right) = \int_0^2 100x\,v(x)dx$$

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

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

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

$$B(u,v) = L(v)$$