1 Sformułowanie silne

$$\frac{d}{dx}\left(-k(x)\frac{du(x)}{dx}\right) = 0$$
$$u(2) = 0$$
$$\frac{du(0)}{dx} + u(0) = 20$$
$$k(x) = \begin{cases} 1 & \text{dla } x \in [0,1] \\ 2 & \text{dla } x \in (1,2] \end{cases}$$

Gdzie u to poszukiwana funkcja

$$[0,2] \ni x \to u(x) \in \mathbb{R}$$

2 Sformułowanie wariacyjne

$$-\frac{dk}{dx}\frac{du}{dx} - k\frac{d^2u}{dx^2} = 0$$
$$-k\frac{d^2u}{dx^2} = 0$$
$$-\int_0^2 k(x)\frac{d^2u}{dx^2} = 0$$
$$-u'(x)v(x)k(x)\Big|_0^2 + \int_0^2 u'v'dx = 0$$
$$u'(0)v(0) - 2u'(2)v(2) + \int_0^2 k(x)u'v'dx = 0$$
$$u'(0)v(0) + \int_0^2 k(x)u'v'dx = 0$$
$$v(0)(20 - u(0)) + \int_0^2 k(x)u'v'dx = 0$$
$$u(0)v(0) - \int_0^2 k(x)u'v'dx = 20v(0)$$
$$B(u,v) = u(0)v(0) - \int_0^2 k(x)u'v'dx,\ \ L(v) = 20v(0)$$
$$B(u,v) = L(v)$$