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HW 02

$$u_t = \alpha^2 u_{xx} - \beta u \qquad 0 < x < 1$$
$$u(0,t) = 1 \qquad u(1,t) = 1$$

Setting the rate of change over time to zero

$$u_t = 0 \qquad 0 = \alpha^2 u_{xx} - \beta u$$
$$0 = \alpha^2 r^2 + 0r + -\beta \qquad r = \frac{\pm\sqrt{-4\alpha^2(-\beta)}}{2\alpha^2}$$

Using the condition from the text that $\beta > 0$

$$r = \pm\sqrt{\frac{4\alpha^2\beta}{4\alpha^4}} = \pm\sqrt{\frac{\beta}{\alpha^2}} = \pm\frac{\sqrt{\beta}}{\alpha} \qquad U(x) = c_1 e^{x\sqrt{\beta}/\alpha} + c_2 e^{-x\sqrt{\beta}/\alpha}$$

Since it is stated that heat is lost we know that the conservation condition $U'(0) = U'(L)$ will not hold. This is because the energy in the system is not conserved.