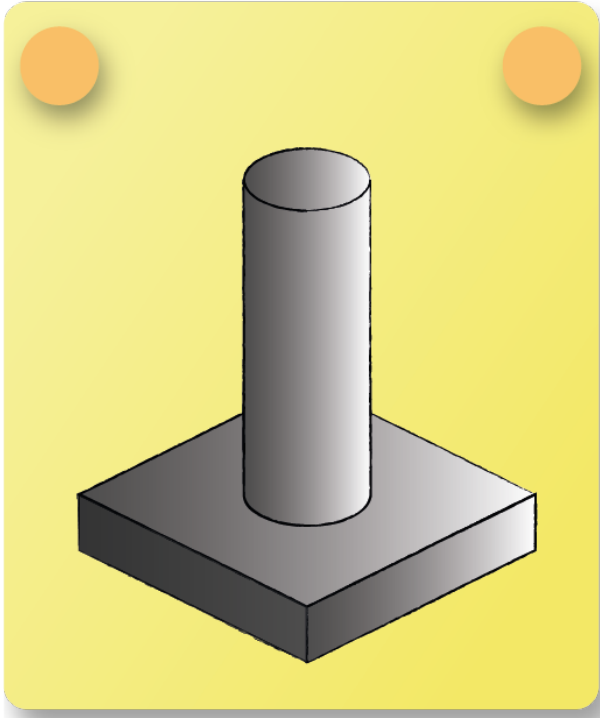


## Lecture Fins Question 5



Which of the following equations describe the fin problem?

The steady energy balance for an infinitesimal slice of fin in axial direction is given as:

$$0 = \dot{Q}_{\text{cond}}(x) - \dot{Q}_{\text{cond}}(x + dx) - \dot{Q}_{\text{conv}}(x)$$

Expressing the energy fluxes in terms of temperature and temperature gradient, respectively yields:



$$0 = -A_c \lambda \frac{\partial T}{\partial x} + A_c \lambda \left( \frac{\partial T}{\partial x} + \frac{\partial^2 T}{\partial x^2} dx \right) - \alpha U [T(x) - T_A] dx$$

and eventually:

$$\frac{\partial^2 T}{\partial x^2} = \frac{\alpha U}{\lambda A_c} [T(x) - T_A]$$

A common simplification of the equation is to introduce the temperature difference  $\Theta(x) = T(x) - T_A$  and just write:

$$\frac{\partial^2 \Theta}{\partial x^2} = \frac{\alpha U}{\lambda A_c} \Theta(x)$$