

## Discussion question

Let  $u(x, t)$  satisfy

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} - \frac{u}{\tau} + H(u - h)$$

for  $x \in \mathbf{R}$  and  $t > 0$ , where  $\tau$  and  $h$  are positive constants and  $H$  is the Heaviside function.

Can you write this equation in the form of a travelling wave solution (moving from left to right)?

What are the steady states of this (travelling wave) equation?

Let  $s_0$  be the lower steady state and  $s_1$  be the higher steady state? Consider a travelling wave solution where  $u(z)$  approaches  $s_0$  as  $z \rightarrow -\infty$  and  $u(z)$  approaches  $s_1$  as  $z \rightarrow +\infty$ . Also, assume that  $u$  and  $u_z$  are continuous. Can you write the travelling wave solution and determine the wave speed?