PS 1

Due: Weds, Jan 28

1: By the book Book section 3.6, problems 1, 4, 5

2: Water, water The dispersion relation for shallow water waves is

$$\omega^2 = k\left(g + \frac{T}{\rho}k^2\right)\tanh(kh)$$

where

$$\begin{aligned} h &= \text{water depth} \\ k &= \text{spatial wave number } (2\pi \text{ / wave length}) \\ \omega &= \text{frequency } (2\pi \text{ / period}) \\ T &= \text{surface tension} \\ \rho &= \text{mass density} \\ g &= \text{gravitational acceleration.} \end{aligned}$$

For water at 25C, $T/\rho = 7.2\times10^{-5}$ N/m^4, and the acceleration due to gravity is $g = 9.8$ m/s^2. Assuming these values, write a code using Newton's method to find k given ω and h, assuming $kh \ll 1$. Your routine should take the form

function k = ps1water(omega, h)