1. Consider a linearised homogeneous isotropic elastic solid, that is a continuous medium where the Cauchy stress tensor is given by the formula
$$\mathbb{T} = \lambda \left(\operatorname{Tr} \varepsilon\right) \mathbb{I} + 2\mu\varepsilon,$$
where $\varepsilon =_{\text{def}} \frac{1}{2}\left(\nabla \mathbf{U} + (\nabla \mathbf{U})^{\top}\right)$ is the linearised strain. Show that the (linearised) governing equations
$$\operatorname{div} \mathbb{T} = \mathbf{0},$$
$$\mathbb{T}\mathbf{n} = \mathbf{f},$$
for a steady state in $\mathbb{R}^2$ admit, if there are no specific body forces, a solution in the form
$$\mathbb{T} = \begin{bmatrix} \frac{\partial^2 \psi}{\partial x_2^2} & -\frac{\partial^2 \psi}{\partial x_1 \partial x_2} \\ -\frac{\partial^2 \psi}{\partial x_1 \partial x_2} & \frac{\partial^2 \psi}{\partial x_1^2} \end{bmatrix},$$
where ψ is called the Airy stress function. Using the *compatibility conditions* in $\mathbb{R}^2$ show that the Airy stress function can not be just *any function* but it must be a solution to the biharmonic equation
$$\Delta\Delta\psi = 0,$$
with suitable boundary conditions. (This means that the problems in plane elasticity can be reduced to a single scalar equation.)

2. If you want to have some fun with calculations based purely on the dimensional considerations, you can read a short note discussing the estimate of the energy released in the first atomic bomb explosion. (A nice Christmas topic, isn't it?) The note summarises a part of the famous papers The formation of a blast wave by a very intense explosion: I. Theoretical discussion and The formation of a blast wave by a very intense explosion: II. The atomic explosion of 1945 by Geoffrey Taylor.