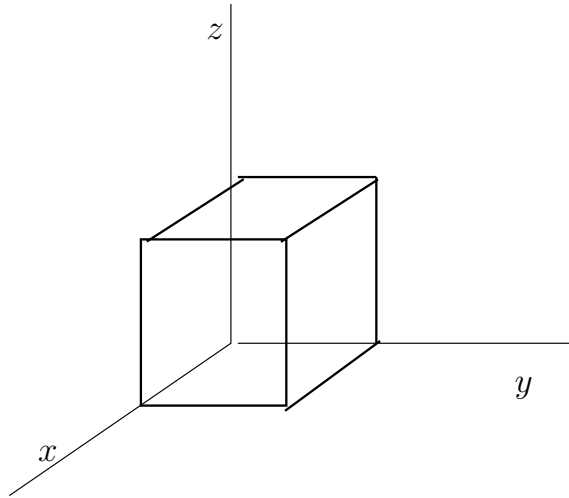


7. (20 pts) The stress tensor in a solid is given as a function of position \mathbf{r} as

$$\boldsymbol{\Sigma} = \begin{pmatrix} -cz & 0 & b \\ 0 & -cz & 0 \\ b & 0 & -cz \end{pmatrix}$$

where b and c are positive constants, and z is the z -component of \mathbf{r} .



- (a) Determine the force on the bottom face of the illustrated cube with sides of length a . Is this a pressure, a tension, a shear, or a combination of some of these?
- (b) Determine the force on the top face of the illustrated cube. Is this a pressure, a tension, a shear, or a combination of some of these?

8. The displacement from equilibrium of the material in an elastic solid with bulk modulus B_M and shear modulus S_M is given by

$$\mathbf{u} = (cx + bz)\hat{x} + (cz + by)\hat{z},$$

where b and c are constants.

- (a) Determine the strain tensor \mathbf{E} .
- (b) Determine the stress tensor responsible for this strain.

PHYS 331 — Final Exam

Tuesday December 11, 2018

1. (20 pts) Show that the equation of motion for an elastic solid supports transverse waves, and derive the wave speed in terms of the properties of the material. You may ignore the effect of gravity.