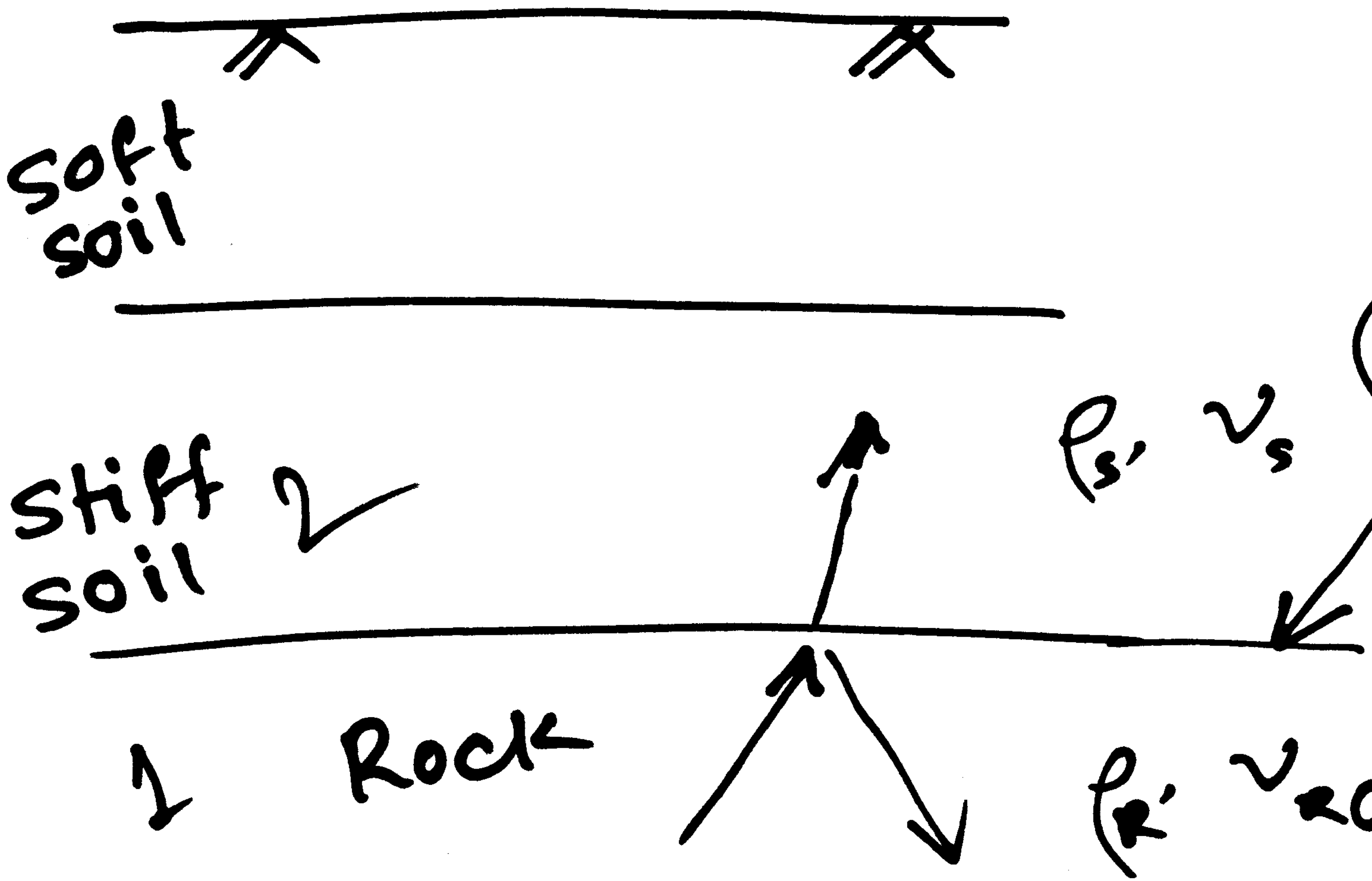
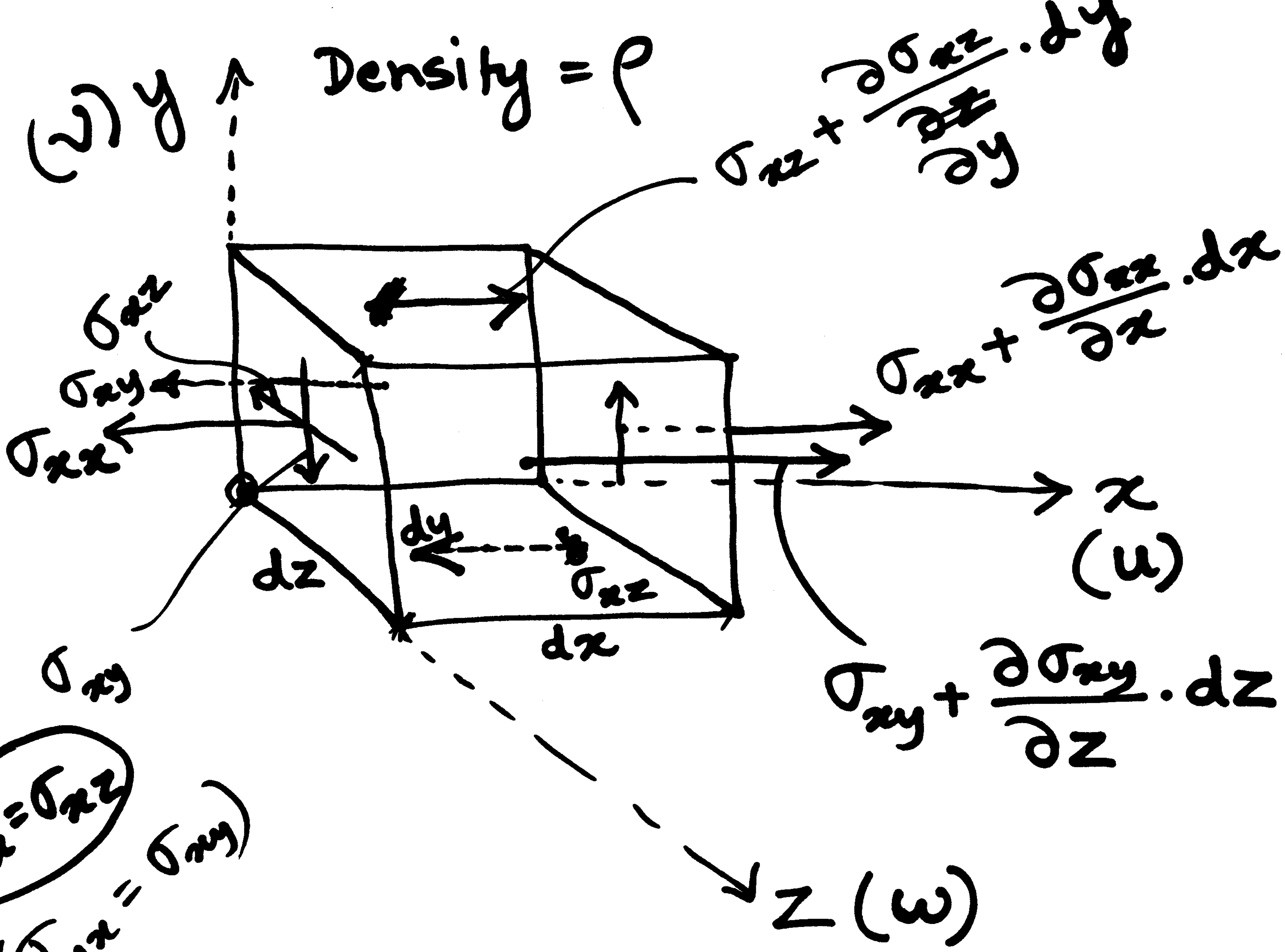


$$\alpha_Z = \frac{\rho_s v_s}{\rho_R v_R}$$

$$0 < \alpha_Z < 1$$

$$\rho_s v_s < \rho_R v_R$$



$\sigma_{zx} = \sigma_{xz}$

$(\sigma_{yx} = \sigma_{xy})$

DC/2

In x-dir.

$$\left(\cancel{\sigma_{xx}}+\frac{\partial\sigma_{xx}}{\partial x}\cdot dx\right)dy\,dz-\cancel{\sigma_{xx}\cdot dy}\cdot dz$$

$$+\left(\cancel{\sigma_{xy}}+\frac{\partial\sigma_{xy}}{\partial z}\cdot dz\right)dx\,dy-\cancel{\sigma_{xy}\cdot dx}\,dy$$

$$+\left(\cancel{\sigma_{xz}}+\frac{\partial\sigma_{xz}}{\partial y}\cdot dy\right)\cdot dx\,dz-\cancel{\sigma_{xz}\cdot dx}\,dz$$

$$=\quad\rho\cdot dx\,dy\,dz\cdot\frac{\partial^2 u}{\partial t^2}$$

$$\frac{\partial \sigma_{xx}}{\partial x}\left(dx\cancel{dy}dz\right)+\frac{\partial \sigma_{xy}}{\partial z}\left(dx\cancel{dy}dz\right)$$

$$+\frac{\partial \sigma_{xz}}{\partial y}\cdot\left(d\cancel{x}dy\,dz\right)$$

$$=\rho\left(dx\cancel{dy}dz\right)\cdot\frac{\partial^2 u}{\partial t^2}$$

$$\left[\because dx\,dy\,dz \neq 0\right]$$

$$\therefore \boxed{\frac{\partial \sigma_{xx}}{\partial x}+\frac{\partial \sigma_{xz}}{\partial y}+\frac{\partial \sigma_{xy}}{\partial z}=\rho\cdot\frac{\partial^2 u}{\partial t^2}}$$

<u>In x-dir.</u>

In y-dir.

$$\frac{\partial \sigma_{yy}}{\partial y} + \frac{\partial \sigma_{xy}}{\partial x} + \frac{\partial \sigma_{yz}}{\partial z} = \rho \cdot \frac{\partial^2 v}{\partial t^2}$$

In z-dir

$$\frac{\partial \sigma_{zz}}{\partial z} + \frac{\partial \sigma_{xz}}{\partial x} + \frac{\partial \sigma_{yz}}{\partial y} = \rho \cdot \frac{\partial^2 w}{\partial t^2}$$

$$\begin{Bmatrix} \sigma_{xx} \\ \sigma_{yy} \\ \sigma_{zz} \\ \sigma_{xy} \\ \sigma_{yz} \\ \sigma_{zx} \end{Bmatrix} = \begin{bmatrix} C_{11} & C_{12} & C_{13} & C_{14} & C_{15} & C_{16} \\ C_{21} & C_{22} & C_{23} & C_{24} & C_{25} & C_{26} \\ \vdots & \vdots & & & & \vdots \\ \vdots & \vdots & & & & \vdots \\ C_{61} & C_{62} & - & - & - & C_{66} \end{bmatrix} \begin{Bmatrix} \epsilon_{xx} \\ \epsilon_{yy} \\ \epsilon_{zz} \\ \epsilon_{xy} \\ \epsilon_{yz} \\ \epsilon_{zx} \end{Bmatrix}$$