Normal Stress in an Axially Loaded Member

straight

Resultant of

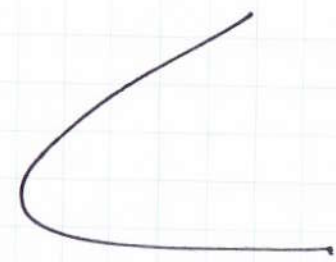force / Area
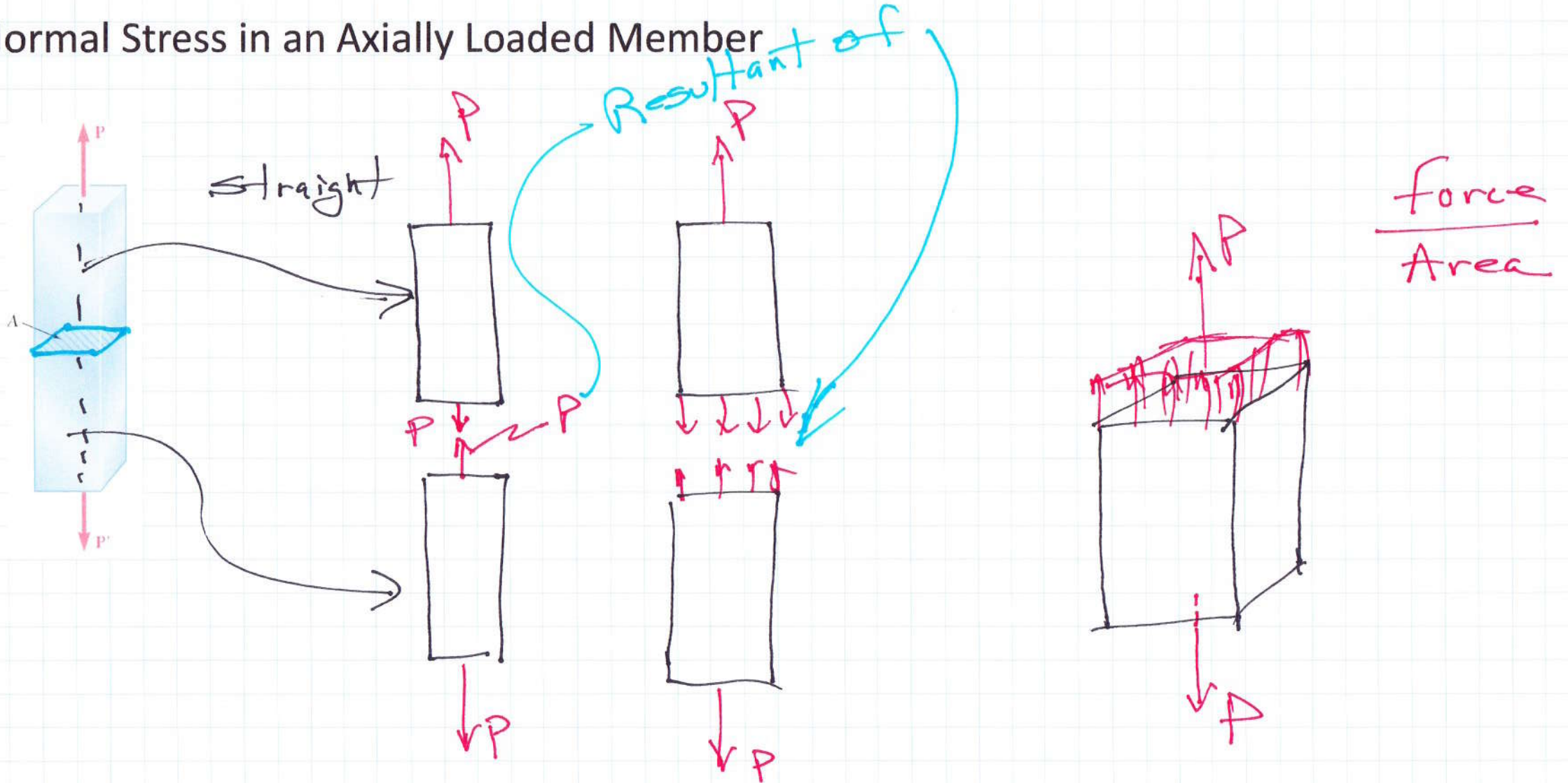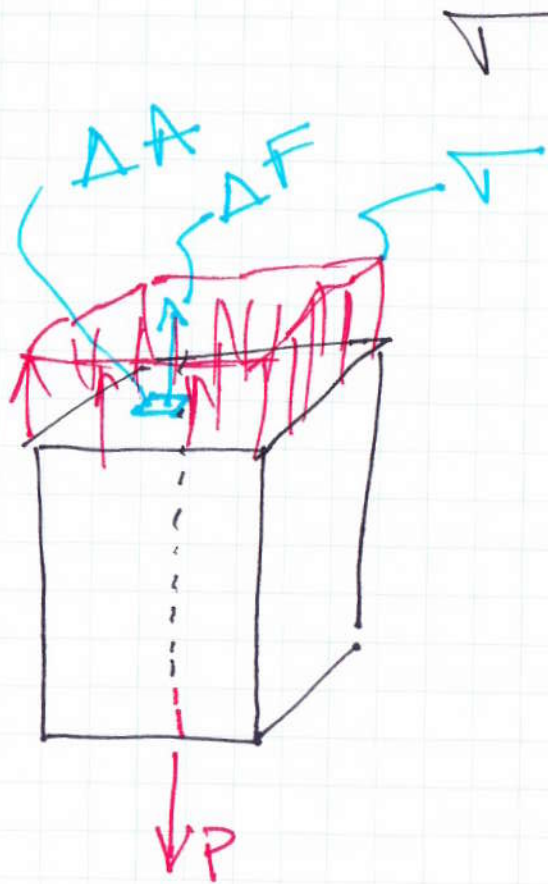
σ — Normal Stress

Normal Stress at a Point
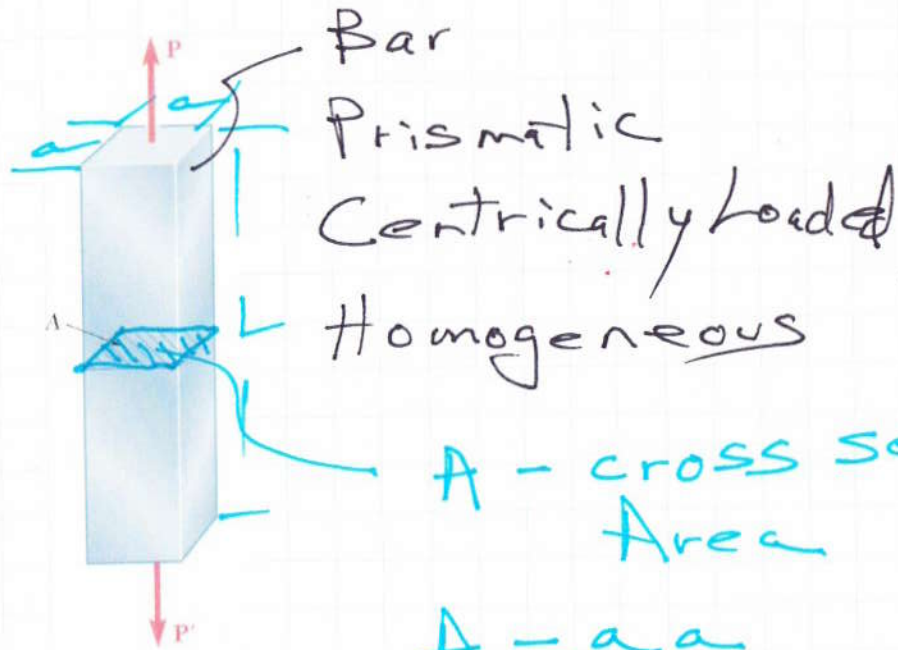
$$\sigma = \lim_{\Delta A \to 0} \frac{\Delta F}{\Delta A}$$

Normal Stress at a Point.

$$P = \int_{Area} \sigma \, dA$$

The line of action of the stress has to be colinear with the applied load P.

Professional graphics copied with permission from Beer, Ferdinand P., E. Russell Johnston, Jr., John T. DeWolf , and David F. Mazurek. 2015. Mechanics of Materials. Seventh Edition. McGraw-Hill.

CVEN 305-301
Mechanics of Solids

Topic ___ Axial Stress ___

Date __6/4/15__
Page __8__ of ____

Uniform Axial Stress

Bar
Prismatic
Centrically Loaded
Homogeneous

A — cross sectional
Area

$A = a \cdot a$

$A = a^2$

Perfectly Uniform

$$\sigma_{AVG} = \frac{P}{A}$$

$\frac{lb}{in^2}$ $\frac{K}{in^2}$

$\frac{N}{m^2}$ $\frac{N}{mm^2}$

$$\frac{Force}{Unit\,Area}$$