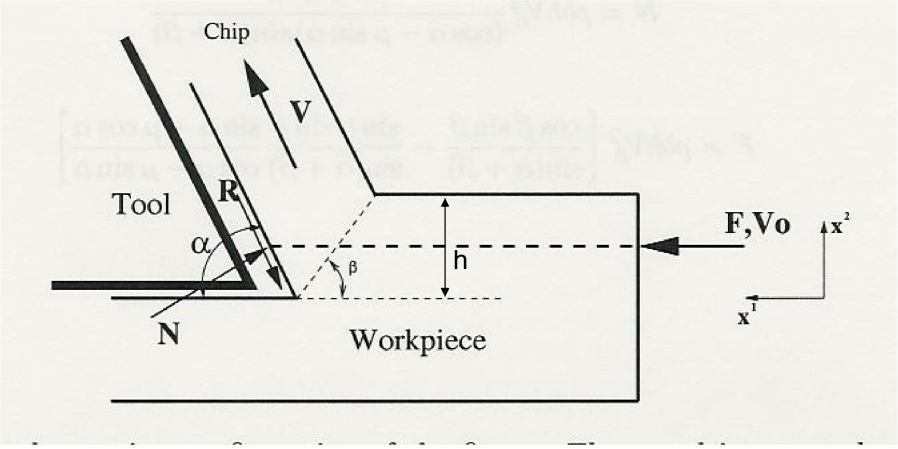
EN221: HW #7, Due Wednesday, 11/06.

1. Problem 6, Page 85, Chadwick.

2. Consider the cutting configuration shown in the figure below. The workpiece is assumed to be an incompressible material of mass density ρ. The opening angle of the stationary cutting tool is α. The work piece is pushed towards the tool by a force of magnitude F, at a constant speed V_0. The thickness (length in the x_3 direction) of the workpiece is b (not shown in the figure). The contact between the chip and tool obeys Coulomb friction with coefficient of friction μ, so that $R = \mu N$, where R and N are the frictional and normal-reaction forces, respectively, as shown in the figure. Note that the chip emerges at a speed V and makes an angle β to the horizontal as shown in the figure.



   (a) Using conservation of mass, relate the chip speed V and the cutting speed V_0.

   (b) Using linear momentum balance, compute the cutting force F and the tool reactions N and R in terms of ρ, b, h, V_0, α, β and μ.

3. Problem 3.3.1, Page 151, Ogden.

4. Problem 6, Page 122, Chadwick. (You need to only derive the field equation; ignore the part on jump conditions)