

This one is a classic P. Efthimion ICF problem. <sup>1</sup> We're told the pellet compresses linearly at sound speed

$$R(t) = R_0 - C_s t$$

The 0th order compression time is then  $T_0 = R_0/C_s$ .

**a)**

Now we'd like to compute the required ICF confinement time, which is defined

$$\tau = \int_0^{T_0} \frac{V(t)}{V(0)} dt$$

where  $V(t)$  is the volume of a spherical capsule. Well this can be rewritten

$$\tau = \int_0^{T_0} \left(1 - \frac{C_s}{R_0} t\right)^3 dt = \frac{C_s}{4R_0}$$

**b)**

Suppose  $C_s = 10^8$  cm/s and  $R_s = 0.5$  mm. What is the confinement time?

$$\tau = \frac{1/20 \text{ cm}}{4 \times 10^8 \text{ cm/s}} = 0.125 \text{ ns}$$

---

<sup>1</sup>This was solved in class, assigned once for HW, and assigned again on the final exam, It apparently also makes the occasional appearance in Generals. Count your lucky stars if this appears on your exam.