Homework #3

1. Two moiré fringe patterns obtained using a tensile specimen (at two different levels of deformation) are attached. Grating frequencies of 150 lines/in were used in both cases. Treat these patterns as "uniform" strain fields. Define the fringe "nearest" the 6-in scale position as n=0, where fringe order increases towards the 10-in scale position.
Infer the axial strain induced along the centerline of the specimen, as follow;

a) Calculate axial strain in accordance with: $\varepsilon = np/(l_g - np)$. Use the fringes which appear between the 6-in and 10-in scale locations… that is, define the gage length, l_g, as $l_g \sim 10$ in- 6 in = 4in

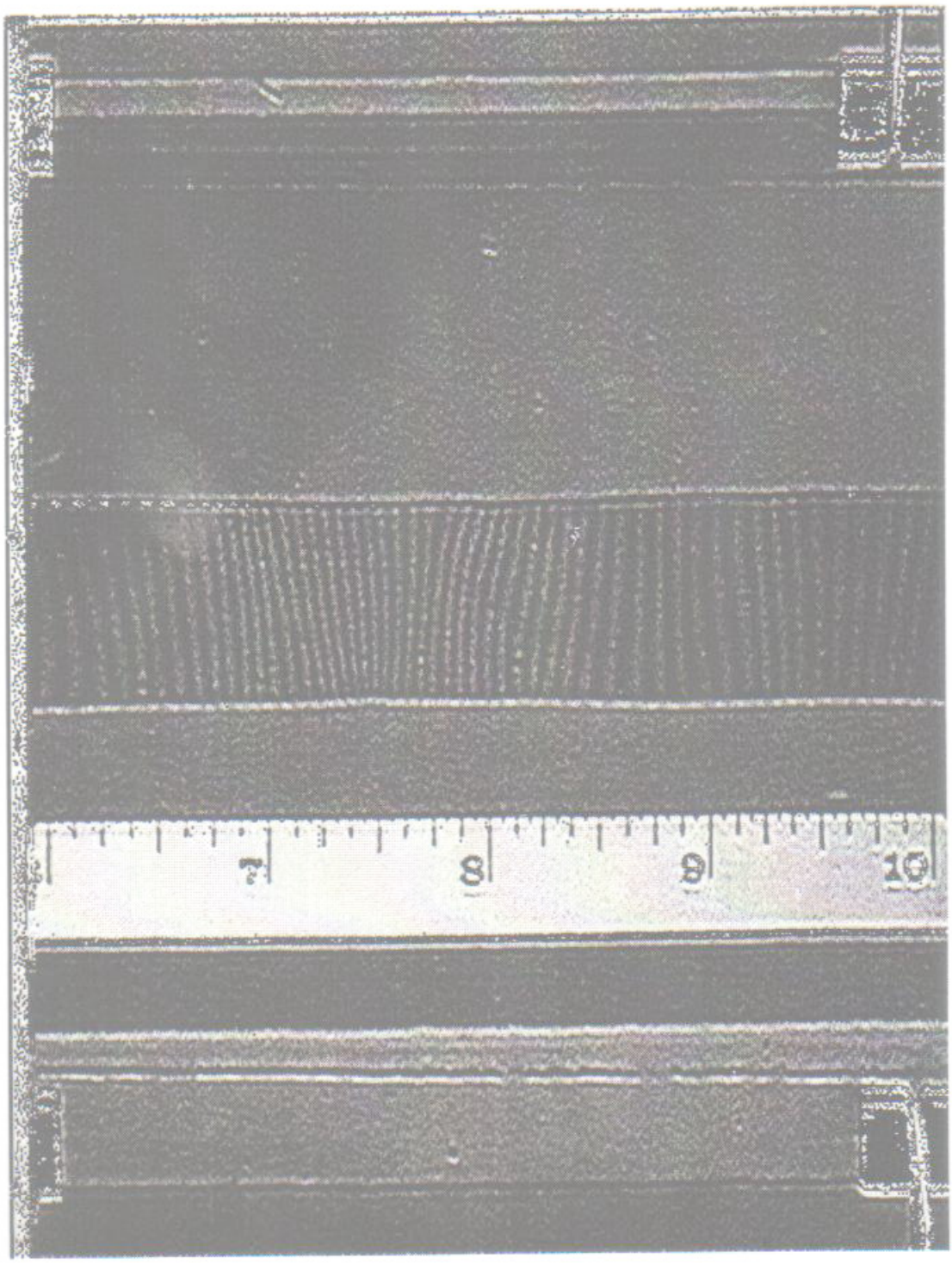
b) Calculate axial strain using the "calculus" approach as discussed in class, the fringe locations must be corrected for displacements in this case

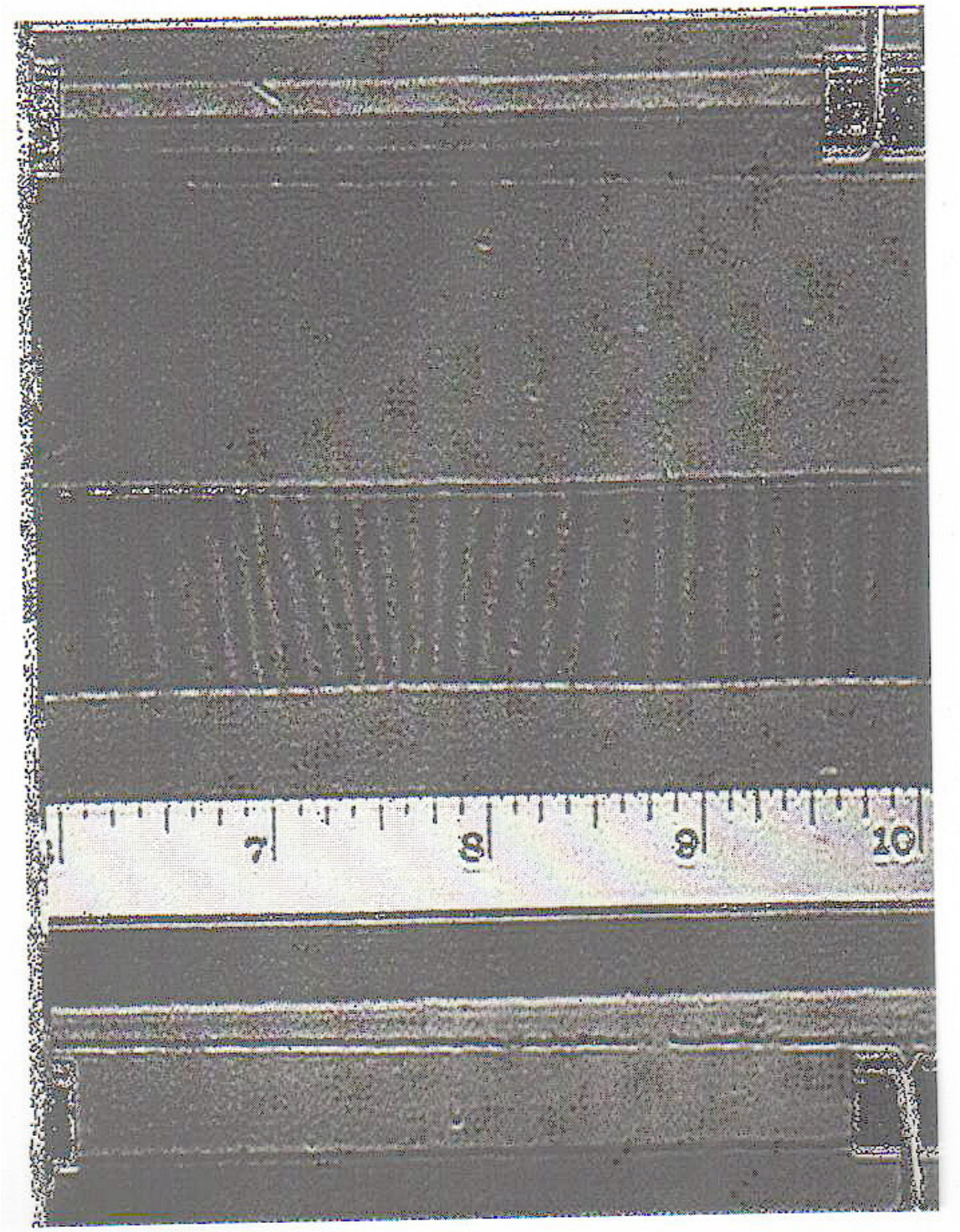
2. A circular plate of radius R and thickness h with a transverse load P applied at the center undergoes a displacement

$$w = \frac{P}{16\pi D}\left[\frac{3+\nu}{1+\nu}(R_o^2 - r^2) + 2r^2 \log\frac{r}{R_o}\right]$$

where $D = Eh^3/12(1-\nu^2)$ is the flexural rigidity of the plate. Sketch the moiré fringe pattern observed if the optical arrange of shadow moiré as shown in class is used in the displacement analysis

3. Assume we have three different periodicity of grating pattern. Two of them are known and one you need to find out its period. Let n = 8 when grating #1 (periodicity = 0.03") overlap with grating #2 (periodicity = 0.031") and n = 9.5 when grating #1 overlap with grating # 3 (the unknown). Find both the unknown period and also the length of the sample.


7
8
9
10


7
8
9
10