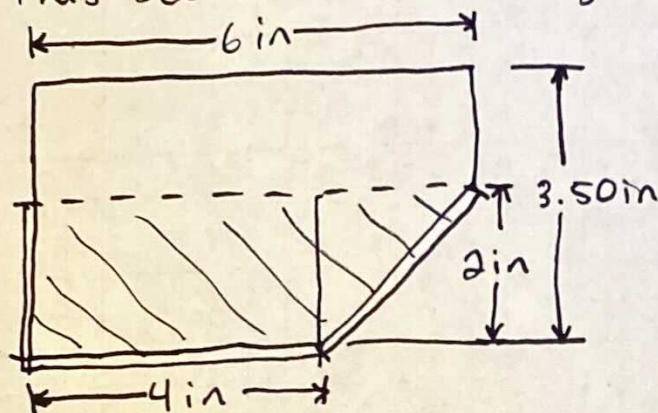


- 6) Compute the hydraulic radius for the section if water flows at a depth of 2.0 in.
This section is a rain gutter on a house.



$$R = \frac{A}{WP}$$

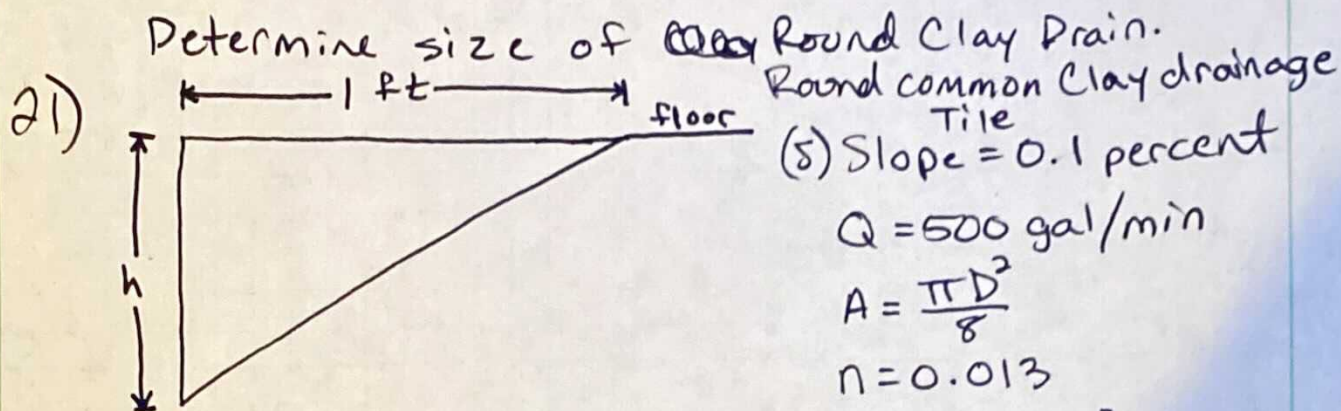
$$A = (4 \text{ in})(2 \text{ in}) + \frac{1}{2}(2 \text{ in})(2 \text{ in})$$

$$A = 10 \text{ in}^2$$

$$WP = \cancel{4 \text{ in}} + \cancel{2 \text{ in}} + (2 \text{ in}) + (4 \text{ in}) + \sqrt{2^2 + 2^2}$$

$$WP = 8.83 \text{ in}$$

$$R = \frac{10 \text{ in}^2}{8.83 \text{ in}} = \boxed{1.13 \text{ in}}$$



$$Q = 500 \text{ gal/min}$$

$$A = \frac{\pi D^2}{8}$$

$$n = 0.013$$

$$500 \frac{\text{gal}}{\text{min}} \times \frac{1 \text{ ft}^3}{449 \frac{\text{gal}}{\text{min}}} = 1.11 \text{ ft}^3/\text{s}$$

$$Q = 1.11 \text{ ft}^3/\text{s}$$

$$Q = \left(\frac{1.49}{n} \right) A R^{2/3} S^{1/2}$$

$$A R^{2/3} = \frac{n Q}{1.49 S^{1/2}} = \frac{(0.013)(1.11)}{(1.49)(0.001)^{1/2}}$$

$$A R^{2/3} = 0.306$$

$$A R^{2/3} = \frac{\pi D^2}{8} \left(\frac{D}{4} \right)^{2/3} = \frac{\pi D^{4/3}}{20.16} = 0.156 D^{4/3}$$

$$0.306 = 0.156 D^{4/3}$$

$$D^{4/3} = \frac{0.306}{0.156}$$

$$D = \left(\frac{0.306}{0.156} \right)^{3/4}$$

$$\underline{D = 1.66 \text{ ft}}$$