

INSTRUCTIONS:

This quiz is open-book, open-note, and you may work with your classmates.

Please answer all questions on your individual papers and submit to me by the end of today's class period.

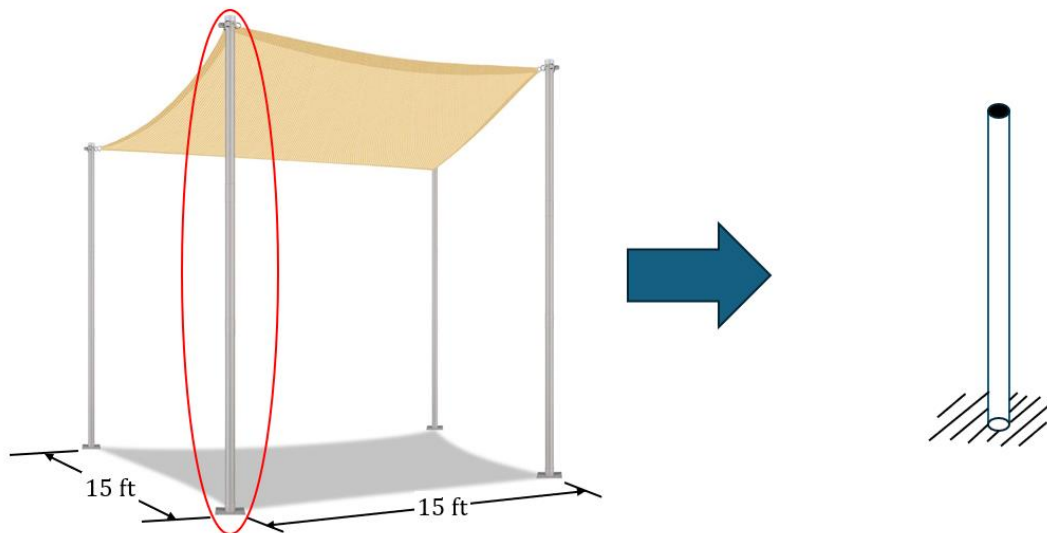
GIVEN:

Evaluate the design of the shelter shown below. The supports poles are solid cylinders, each 2 inches in diameter.

The shade is 15' x 15' in size, weighs 50 lbf, and the weight is evenly distributed to all four supports.

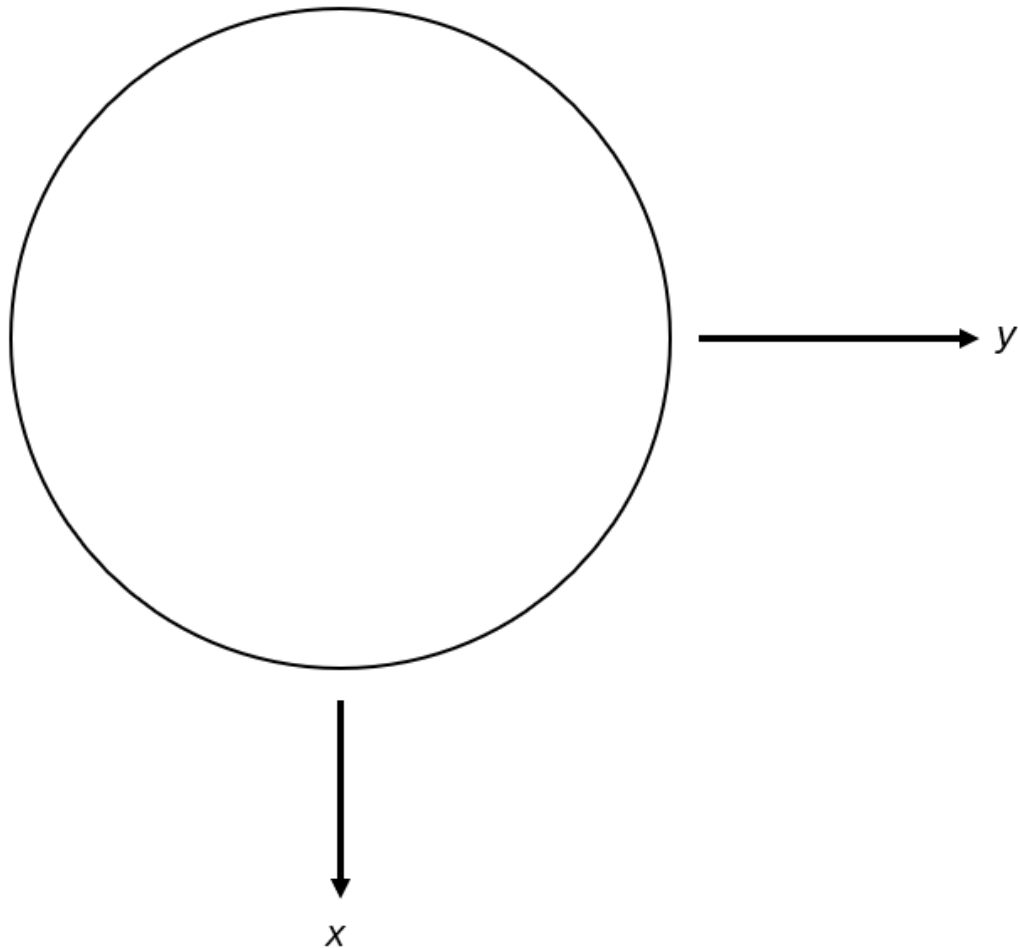
FIND:

- 1) (20 points) Draw a Free-Body Diagram (FBD) of one pole, simplifying the weight of the shade as a point load at the center. Use the diagram provided on the right below.



- 2) (20 points) The internal loads acting in the pole are (select all that apply):
 - ☐ Axial
 - ☐ Torsion
 - ☐ Bending
 - ☐ Transverse shear
- 3) (20 points) Identify the location of the critical cross section of the pole.

- 4) (20 points) For the critical cross-section, identify the critical element(s). Show the location(s) of the critical element(s) on the cross-section below.



- 5) (20 points) For each critical element identified above, calculate the numerical values of each stress acting and show the stress state on a stress element.

BONUS: (10 points) Where might an additional support bar be placed to most effectively reduce the maximum stress on the existing poles? Explain your reasoning.