NAME: _____________________________

EXAM 1

100 points
You are allowed to use a calculator and drawing equipment, only.
50 minute time limit

Given Formulae:
Normal stress $\sigma = \frac{F}{A}$, where $F$ is the force that is normal to the cut and $A$ is the area of the cut.
Shear stress $\tau = \frac{V}{A}$, where $V$ is the force that is parallel to the cut and $A$ is the area of the cut.
1. (35 points) Determine the magnitude of internal bending moment that is present at the location of the 60 kip point load and specify whether this moment results in compression on the outside of the arch or on the inside of the arch (see below).

Given: A and B are pinned supports. C is a hinge (pinned connection).
2. (30 points) A 6” diameter solid wooden pole is embedded 40 inches into the ground and is subjected to a vertical force \( P \) that will pull the pole out of the ground. It is known that the average shear stress between the pole and the dirt will be 8 psi (lb/in\(^2\)) when the pole pulls out of the ground. The overall length of the pole is 180 inches.

**Determine** the normal stress on the cross-section of the pole when it is pulled out and report the answer in psi (lb/in\(^2\)).

Assume that the interface between the bottom end of the bar and the concrete does not support any tensile stress.
3. (35 points). Determine the largest distributed load $w$ (units: N/m) that can be supported IF beam AB fails when the magnitude of internal moment at D reaches 800 N-m.

Given: Pinned supports at A and C. Pinned connection at B.