**Vector Algebra Homework (20 Points)**

(jas, Vector Algebra HW.docx, 10/14/2025)

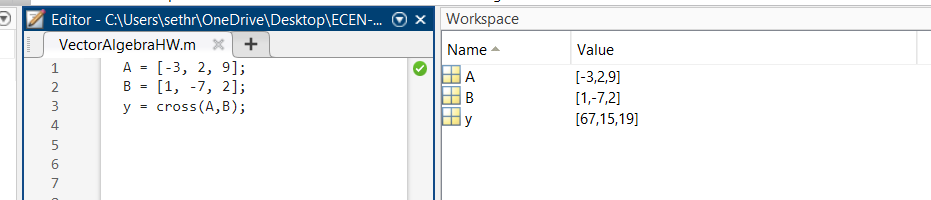
Use units and clearly label answers using 3 or 4 significant digits where appropriate. **Show your work** so that if necessary partial credit can be awarded.

1. Using the conversion relationships given in Table 3-2, convert the point P = (2, 4, 7) from the Cartesian (rectangular) coordinate system to:
2. Cylindrical Coordinates using degrees for angles. (3 Points.)
3. Spherical coordinates using degrees for angles. (3 Points.)
4. Calculate the dot product between the two vectors A = [-3, 7, 8], and B = [-40, 57, 1], first by hand including intermediate steps (2 points), then by using the MATLAB **dot**() function (2 points). (4 Points total.)

A screenshot of a computer

AI-generated content may be incorrect.

1. Calculate the cross product between the two vectors A = [-3, 2, 9], and B = [1, -7, 2], first by hand including intermediate steps (2 points), then by using the MATLAB **cross**() function (2 points). (4 Points total.)



1. A blue cylinder with arrows and a straight line

   Description automatically generatedGiven as illustrated in the adjacent diagram, derive thesurface area of a cylinder of radius r and height l, not including the end caps. Include at least 2 steps of your derivation below with your answer as a function of r and l.

(3 points.)

1. Diagram

   Description automatically generatedGiven as illustrated in the adjacent diagram, derive thesurface area of a sphere of radius R, including at least 2 steps of your derivation below with your answer as a function of R. (Hint: Vary 𝜙 from 0 to 2π in your integration.) (3 points.)