Disclaimer: these are just some of the types of problems which might appear on the exam. Just because there is not a problem here on a given topic does not necessarily mean that it will not appear on the exam. Conversely, just because there is a problem here does not mean that there will be a similar problem on the exam.


Other suggested problems:

1. Let \( v = (1, 0, -2) \) and let \( w = (-2, -2, 1) \).

   (i) Find a unit vector \( u \) which points in the same direction as \( w \).

   (ii) Find the component of \( v \) along \( u \) and the (vector) projection \( p_u(v) \).

   (iii) Find \( v - p_u(v) \) and verify that it is perpendicular to \( u \).

   (iv) Compute the distance from \( v \) to the line through the origin in \( \mathbb{R}^3 \) and \( w \).

2. Find the following determinants:

   (a) \( \det \begin{pmatrix} 2 & -4 \\ 3 & 7 \end{pmatrix} \); (b) \( \det \begin{pmatrix} 3 & 5 \\ 3 & 2 \end{pmatrix} \);

   (c) \( \det \begin{pmatrix} 1 & 1 & -1 \\ 2 & 3 & 2 \\ 1 & 2 & 1 \end{pmatrix} \); (d) \( \det \begin{pmatrix} 1 & 1 & -1 \\ 2 & 3 & 2 \\ 0 & -1 & -4 \end{pmatrix} \); (e) \( \det \begin{pmatrix} 1 & 1 & -1 \\ 2 & 3 & 2 \\ 0 & -1 & 1 \end{pmatrix} \).

   For (c), (d), (e), what is the volume of the parallelepiped defined by the vectors \( 0 = (0, 0, 0) \) and the three rows \( v_1, v_2, v_3 \) of the given matrix? (The 8 vertices of the parallelepiped are \( 0, v_1, v_2, v_3, v_1 + v_2, v_1 + v_3, v_2 + v_3, \) and \( v_1 + v_2 + v_3 \). Compare Figure 3 on Stewart p. 819.) What is the meaning of your answer for (d)?