

Mathematics 1E2 2006–07
HW 3 Due 31/10/06

Name: _____
 ID: _____

(1) (12 marks) Let $P = (2, 3), Q = (4, 5)$. (i) $P + Q = (6, 8)$ (ii) $P - Q = (-2, -2)$ (iii) $\vec{PQ} = (2, 2)$ (iv) $\vec{QP} = (-2, -2)$.

(2) (12 marks) Let $P = (2, 3, 4), Q = (5, 6, 7)$. Calculate (i) $P + Q = (7, 9, 11)$ (ii) $P - Q = (-3, -3, -3)$ (iii) $\vec{PQ} = (3, 3, 3)$ (iv) $\vec{QP} = (-3, -3, -3)$.

(3) (13 marks) Calculate the intersection of the three planes

$$2x + 4z = 10, \quad 2x + 2y + 10z = 26, \quad 3x + y + 8z = 21.$$

$$\begin{array}{cccccc} 2 & 0 & 4 & 10 & *(1/2) & =R1 \\ 2 & 2 & 10 & 26 & -2*R1 & \\ 3 & 1 & 8 & 21 & -3*R1 & \\ \\ 1 & 0 & 2 & 5 & & \\ 0 & 2 & 6 & 16 & *(1/2) & =R2 \\ 0 & 1 & 2 & 6 & -1*R2 & \end{array} \quad \begin{array}{cccccc} 1 & 0 & 2 & 5 & -2*R3 & \\ 0 & 1 & 3 & 8 & -3*R3 & \\ 0 & 0 & -1 & -2 & *(-1) & =R3 \\ \\ 1 & 0 & 0 & 1 & & \\ 0 & 1 & 0 & 2 & & \\ 0 & 0 & 1 & 2 & \text{in rref} & \end{array}$$

Solution: $x = 1, y = 2, z = 2$.

(4) (13 marks) Calculate the intersection of the three planes

$$2x + 2y - 2z = -2, \quad x + y + z = 3, \quad x + y - 4z = -7$$

$$\begin{array}{cccccc} 2 & 2 & -2 & -2 & *(1/2) & =R1 \\ 1 & 1 & 1 & 3 & -1*R1 & \\ 1 & 1 & -4 & -7 & -1*R1 & \\ \\ 1 & 1 & -1 & -1 & +1*R2 & \\ 0 & 0 & 2 & 4 & *(1/2) & =R2 \\ 0 & 0 & -3 & -6 & +3*R2 & \end{array} \quad \begin{array}{cccccc} 1 & 1 & 0 & 1 & & \\ 0 & 0 & 1 & 2 & & \\ 0 & 0 & 0 & 0 & \text{in rref} & \end{array}$$

Solution: $x = 1 - r, y = r, z = 2$.