Problem 1 Sec 2.1 #14

Sol $\forall k \in \mathbb{R}$, $\forall u_1, u_2 \in U$. $S(ku_1+u_2) = T(ku_1+u_2) = kT(u_1)+T(u_2) = kS(u_1)+S(u_2)$

(ku_1+u_2 in U because U is a subspace; $T(ku_1+u_2) = kT(u_1)+T(u_2)$ by linearity.)

problem 1 Sec 2.1 #15

Sol $U = \text{span}(\{(1,1,1), (2,1,0)\})$ $T: \mathbb{R}^3 \to \mathbb{R}$ defined by $T((a_1,a_2,a_3)) = 3a_1+2a_2+a_3$

Let $x = x_1(1,1,1) + x_2(2,1,0)$. Then $x \in U$ and

$$T|_U(x) = x_1 T(1,1,1) + x_2 T(2,1,0)$$
$$= x_1(3+2+1) + x_2(6+2+0) = 6x_1+8x_2$$

problem 2. Sec 2.3 #3(a),(b),(c) any 2 questions

(a) $T: \mathbb{R}^3 \to \mathbb{R}^4$ defined by $T(x_1,x_2,x_3) = (x_1-x_2,\ x_2-x_3,\ x_1+x_2-x_3,\ x_3-x_1)$