(Q2)
(a)

$$
\begin{aligned}
x + 0y - 2z + w &= 0 \\
x + y - z + 0w &= 0 \\
2x + y - 3z + w &= 0
\end{aligned}
$$

(b)

$$
\begin{pmatrix}
1 & 0 & 2 & 1 & | & 0 \\
1 & 1 & -1 & 0 & | & 0 \\
2 & 1 & -3 & 1 & | & 0
\end{pmatrix}
$$
$$\downarrow$$
$$
\begin{pmatrix}
1 & 0 & -2 & 1 & | & 0 \\
0 & 1 & 1 & -1 & | & 0 \\
0 & 1 & 1 & -1 & | & 0
\end{pmatrix}
$$
$$\downarrow$$
$$
\begin{pmatrix}
1 & 0 & -2 & 1 & | & 0 \\
0 & 1 & 1 & -1 & | & 0 \\
0 & 0 & 0 & 0 & | & 0
\end{pmatrix}
$$

We then have

$$
\begin{aligned}
x &= 2s - t \\
y &= -s + t \\
z &= s \\
w &= t
\end{aligned}
$$

And thus

$$
\begin{aligned}
&(2s - t, -s + t, s, t) \\
&= (2s, -s.s.0) + (-t, t, 0, t) \\
&= s(2, -1, 1, 0) + t(-1, 1, 0, 1)
\end{aligned}
$$

(c)
This follows from the fact that $(2, -1, 1, 0)$ and $(-1, 1, 0, 1)$ are linearly independent, and thus is a basis for W.
(d)
W is closed under scaling and vector addition, so it is a subspace.