3.

$(v+w) \times (v-w) = 0$ and $\|v\| = \|w\|$

$= v^2 - vw + wv - w^2$

$= v^2 - w^2 = 0$

$= v^2 = w^2$

$= \boxed{v = w}$

$\sqrt{v^2} = \sqrt{w^2}$

$\boxed{v = w}$

3. $(v+w) \times (v-w) = 0$ and $\|v\| = \|w\|$

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$= \boxed{v = w}$

4.

$$A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \quad AB = \begin{bmatrix} (1(0)+0(1)) & 1(0)+0(0) \\ 0(0)+0(1) & 0(0)+0(0) \end{bmatrix} = 0$$

a_1 and b_1 are never multiplied together in AB so make them the only non-zero values

$$BA = \begin{bmatrix} 0(1)+0(0) & 0(0)+0(0) \\ 1(1)+0(0) & 1(0)+0(0) \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix} \neq 0$$

5.

(a) $(t, t^2) = c(t) \quad t \in \mathbb{R}$

(b) looking at a graph of $\frac{x^2}{9} + \frac{y^2}{25} = 1$ we see that x is $[-3, 3]$ and y is $[-5, 5]$

$\cos^2 t + \sin^2 t = 1 = \frac{x^2}{3^2} + \frac{y^2}{5^2} = 1$ so

$c(t) = (3\cos t, 5\sin t), t \in [0, 2\pi]$

6.

To be perpendicular $r(t) \cdot r'(t) = 0$

if $\|r(t)\| = 0$, then $r'(t) = 0$

so

$r(t) \cdot r'(t) = r(t) \cdot 0 = 0$