C1)

- A set $\{v_1, v_2, \dots, v_n\}$ of vectors is Linearly independent if and only if

$$a_1\vec{v}_1 + a_2\vec{v}_2 + \dots + a_n\vec{v}_n = 0$$

only has the trivial solution.

- The Span of a set of $\{v_1, v_2, \dots, v_m\}$ vectors in $\mathbb{C}^n$ is $\mathbb{C}^n$

- A transformation $T: \mathbb{C}^m \to \mathbb{C}^n$ is Linear if and only if $T(\vec{u}+\vec{v}) = T(\vec{u}) + T(\vec{v})$ and $T(\alpha\vec{u}) = \alpha T(\vec{u})$

- A transformation $T: \mathbb{C}^m \to \mathbb{C}^n$ is onto if and only if the columns of the standard matrix of T span $\mathbb{C}^n$

- A transformation $T: \mathbb{C}^m \to \mathbb{C}^n$ is one-to-one if and only if $T(x)=0$ has only the trivial solution

C2) $T: \mathbb{C}^m \to \mathbb{C}^n$

	Cannot be one-to-one	Cannot be onto
$m < n$	False	~~True~~ True
$m > n$	~~True~~ False	False
$m = n$	False	False

(3)

1. $F(x) = x$

2. $F(x) = x^3 - x^2$

~~3. F(x) = [illegible]~~ 3. $\frac{1}{x}$

4. $F(x) = \frac{1}{x^2}$

C 4)

$A\vec{v} = \vec{v}$ $\quad A\vec{w} = -\vec{w}$

If v and w are linearly dependent, then for some scalar x_1, $x_1\vec{v} = w$ (I)

this gives $x_1\vec{v} - \vec{w} = 0$ (I)

because $\vec{v} = A\vec{v}$ and $-\vec{w} = A\vec{w}$

we can write $x_1 A\vec{v} + A\vec{w} = 0$ (II)

because for any matrix B, ~~the~~

and any set of indexed vectors $\{u_1, u_2, \dots u_n\}$

$Bu_1 + Bu_2 + \dots Bu_n = B(u_1 + u_2 + \dots + u_n)$

$x_1 A\vec{v} + A\vec{w} = 0 \leftrightarrow A(x_1\vec{v} + \vec{w}) = 0$ (II)

we know that A is not the null-matrix, so this gives $x_1\vec{v} + \vec{w} = 0$ (II)

~~there~~ because the only solution that satisfies I $x_1\vec{v} - \vec{w} = 0$ and II $x_1\vec{v} + \vec{w} = 0$ is the trivial solution $\vec{v} = \vec{w} = \vec{0}$ and the conditions exlude this solution $\vec{v}$ and $\vec{w}$ must be linearly independent.