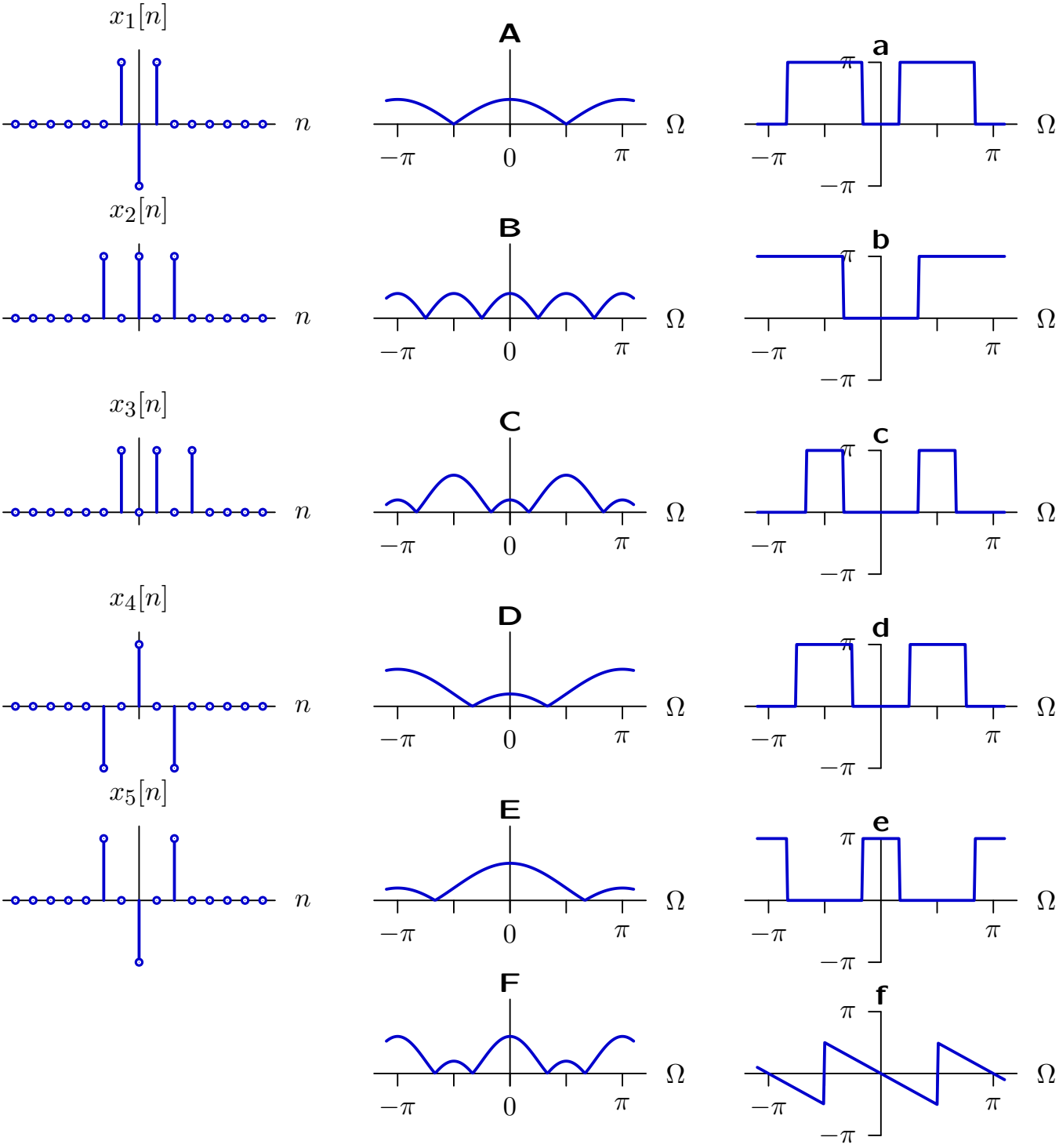
Fourier Transforms

The diagrams below show five DT signals (x_1 through x_5), six DTFT magnitude plots (labeled **A** through **F**), and six DTFT angle plots (labeled **a** through **f**).



For each signal in the left column, identify its magnitude (A-F or none) and angle (a-f or none).

Part 1. $X_1(\Omega) = 2\cos(\Omega) - 1$

magnitude: D

angle: b

Part 2. $X_2(\Omega) = 2\cos(2\Omega) + 1$

magnitude: F

angle: c

Part 3.

$x_3[n] = x_2[n-1]$

$X_3(\Omega) = X_2(\Omega)e^{-j\Omega}$

We also have $\angle X_3(\Omega) = \angle X_2(\Omega) - \Omega$. So we are looking for a phase that is linearly decreasing as Ω increases. Graph f `almost` looks right (the phase is linear in Ω), but it doesn't have jumps by $\pm\pi$ at the same points that graph c does, so the correct answer is `none`.

magnitude: F

angle: none

Part 4. $X_4(\Omega) = 1 - 2\cos(2\Omega)$

magnitude: C

angle: e

Part 5. $x_5[n] = -x_4[n]$

$X_1(\Omega) = -X_3(\Omega)$

Thus, its magnitude should be the same as $|X_2(\Omega)|$, and its phase graph should have the same rough shape as X_4's, but with 0 and π swapped.

magnitude: C

angle a