1. In order to express $\sum\limits_{n=-\infty}^{\infty} d_n e^{ixn} = \sum\limits_{n=-\infty}^{\infty} c_{2n} e^{ixn}$ in terms of f, first we will "get rid of" the odd indexed c_n's in $\sum\limits_{n=-\infty}^{\infty} c_n e^{ixn}$, i.e. we will express $\sum\limits_{n=-\infty}^{\infty} c_{2n} e^{ix2n}$ with the help of $f(x)$.

$$\sum_{n=-\infty}^{\infty} c_{2n} e^{ix2n} = \frac{\sum\limits_{n=-\infty}^{\infty} c_n e^{ixn} + \sum\limits_{n=-\infty}^{\infty} (-1)^n c_n e^{ixn}}{2} =$$

$$= \frac{f(x) + \sum\limits_{n=-\infty}^{\infty} c_n e^{in(x+\pi)}}{2} =$$

$$= \frac{f(x) + f(x+\pi)}{2}.$$

A change of variable, $y := 2x$, gives

$$\sum_{n=-\infty}^{\infty} c_{2n} e^{iny} = \frac{f(y/2) + f(y/2+\pi)}{2}.$$

□