



Example 3-8: Synthesize a Chirp Formula

Suppose we want to synthesize a frequency sweep from $f_1 = 220$ Hz to $f_2 = 2320$ Hz over a 3-second time interval, i.e., the beginning and ending times are $t = 0$ and $t = T_2 = 3$ sec. First of all, it is necessary to create a formula for the instantaneous frequency

$$f_i(t) = \frac{f_2 - f_1}{T_2}t + f_1 = \frac{2320 - 220}{3}t + 220$$

Then we must integrate $2\pi f_i(t)$ to get the angle function:

$$\begin{aligned}\psi(t) &= \int_0^t \omega_i(u) du \\ &= \int_0^t 2\pi \left(\frac{2320 - 220}{3}u + 220 \right) du \\ &= 700\pi t^2 + 440\pi t + \phi\end{aligned}$$

where the phase shift, ϕ , is an arbitrary constant. The chirp signal is $x(t) = \cos(\psi(t))$.

