\( x(t) = 2 + 3\cos(0.2t) + \cos(0.25t + \pi/2) + 4\cos(0.3t - \pi) \)

Frequencies are 1.2 rad/sec, 0.25 rad/sec, 0.3 rad/sec.

The greatest common divisor is 0.05 rad/sec (all the frequencies are divided by 0.05 in an integer number of ways) \( \Rightarrow w_0 = 0.05 \text{ rad/sec} \)

**Sinusoidal spectrum**

**Exponential spectrum**

**Magnitude**
b) \[ x(t) = 1 + 10\cos(2\pi(\omega_0)t + \pi/8) + 2\cos(2\pi(3\omega_0)t - \pi/4) \]

The greatest common divisor is \(2\pi(\omega_0)\) rad/sec.

\(\omega_0 \text{ Hz.} \Rightarrow f_0 = 60 \text{ Hz}\)

**Sinusoidal spectrum**

**Exponential spectrum**
a) low frequency signal: $A = \frac{15}{2} = 7.5$, $T = 0.2$ so
\[ w = \frac{2\pi}{T} = 10\pi, \quad \phi = 0 \text{ (peak at } t = 0) \]

high frequency: $A = 5.5/2 = 2.75$, $T = 0.04 \Rightarrow w = \frac{2\pi}{T} = 50\pi$
\( (5 \text{ cycles of high freq in } 0.2 \text{ sec}) \), $\phi = 0$
offset = 2

\[ x(t) = -2 + 7.5 \cos(10\pi t) + 2.75 \cos(50\pi t) \]

b) low freq: $A = 1.8/2 = 0.9$, $T = 0.05 \Rightarrow w = 40\pi$, $\phi = 0$

high freq: $A = 4.2/2 = 2.1$, $T = 0.017 \text{ (or 3 cycles in } 0.05\text{sec) }$
$\phi = 0$
\[ w = 118\pi \]
offset = 1

\[ x(t) = 1 + 0.9 \cos(40\pi t) + 2.1 \cos(118\pi t) \]

These are estimates based on the plot, exact values may differ.
\[ \chi(t) = 2 + \cos \left( \frac{2\pi}{0.02} t \right) + 3 \cos \left( \frac{2\pi}{0.005} t \right) \]

\[ = 2 + \cos \left( 100\pi t \right) + 3 \cos \left( 400\pi t \right) \]
4. \( x(t) = 10 \left[ \frac{e^{j200\pi t} + e^{-j200\pi t}}{2} \right] \left[ \frac{e^{j200\pi t} + e^{-j200\pi t}}{2} \right] \)

\[ = \frac{10}{4} \left[ e^{j200\pi t} + e^{-j200\pi t} + e^{j1800\pi t} + e^{-j1800\pi t} \right] \]
5. Time signals and their corresponding spectra are shown below. However, they are in random order. Match them up.
1. ___e___  2. ____a___  3. ___c___  4. ____b___  5. ___d___