**[11:00-11:30] Beat notes and periodic signals**

When two sinusoidal signals and are multiplied together, the result contains the sum and difference frequencies:

Example:

Relationship between sinusoids and complex exponentials

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A signal is periodic with period if for any integer .

A periodic signal can have multiple periods. The smallest positive period is the fundamental period. The fundamental frequency is is computed as

**[11:35-12:00] Fourier series**

Any periodic signal can be synthesized by adding complex exponentials with harmonic frequencies

where is the fundamental frequency.

Notice that

Thus, the real component is periodic, the imaginary component is periodic, and both have the same periodicity.

A special case occurs with conjugate symmetric amplitudes , where , which leads to real-valued

**[12:00-12:50] Fourier series analysis and synthesis formulae**

The Fourier series coefficients can be computed from a periodic signal by integration over one fundamental period :

A periodic signal can be synthesized by adding together complex exponentials weighted by the Fourier series coefficients :

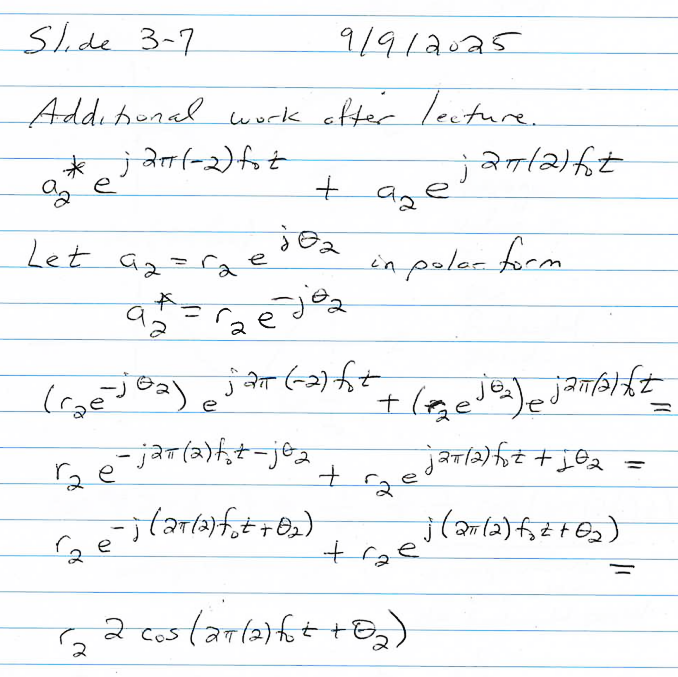
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**A paper with math equations and formulas

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**A sheet of math equations

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