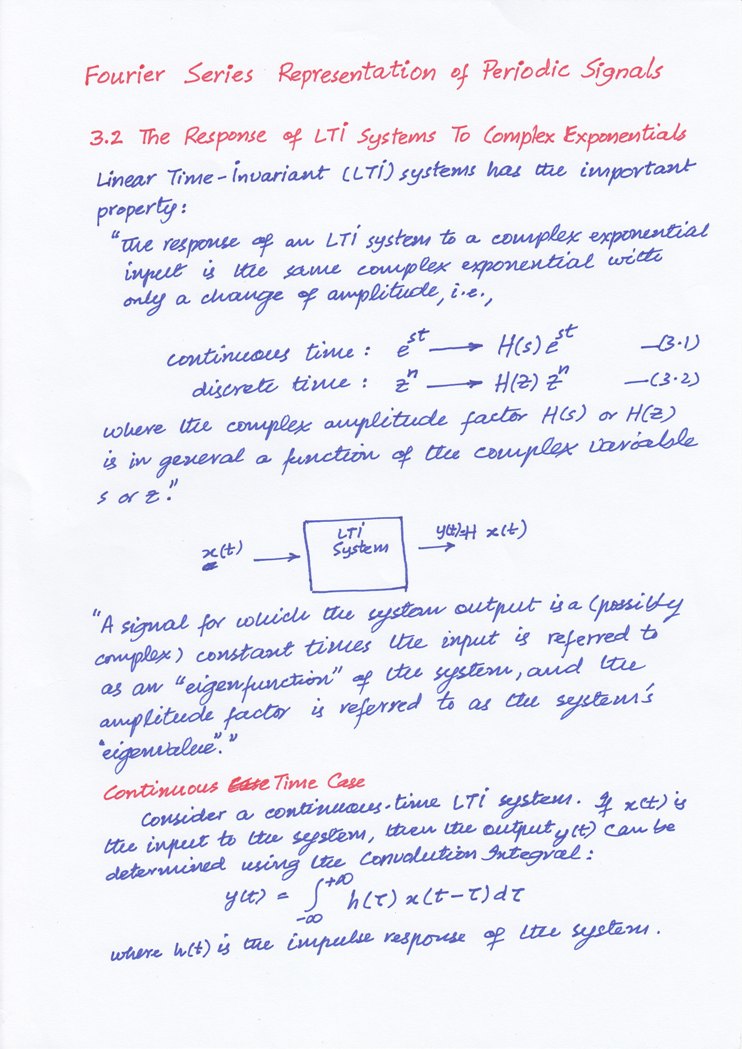
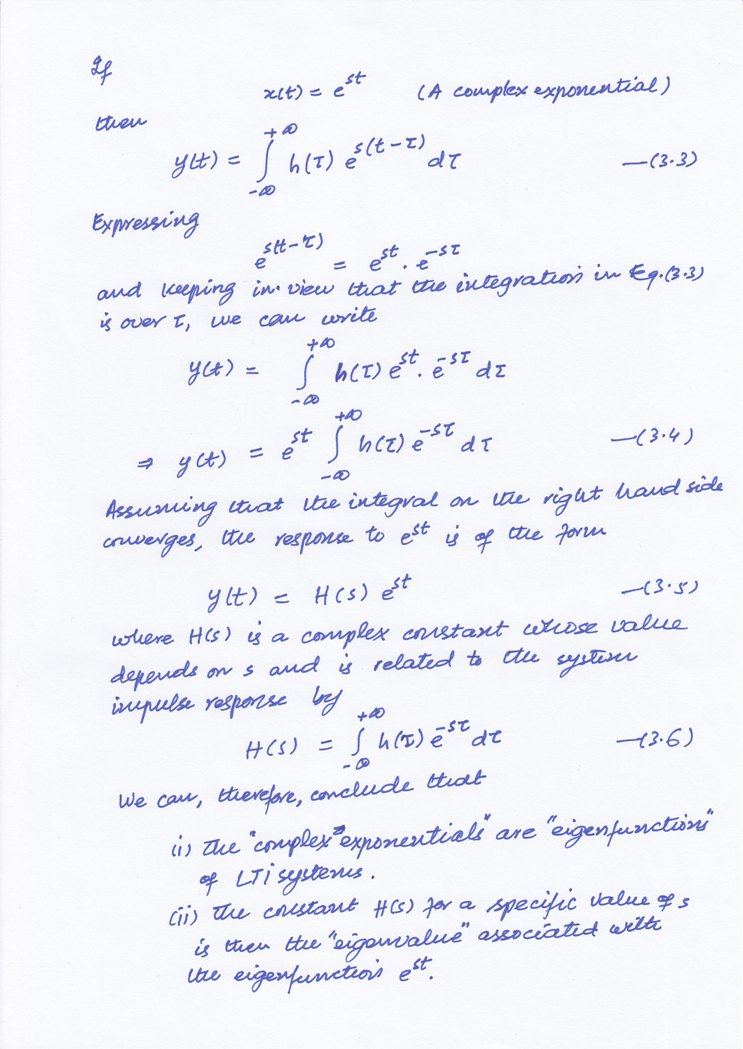
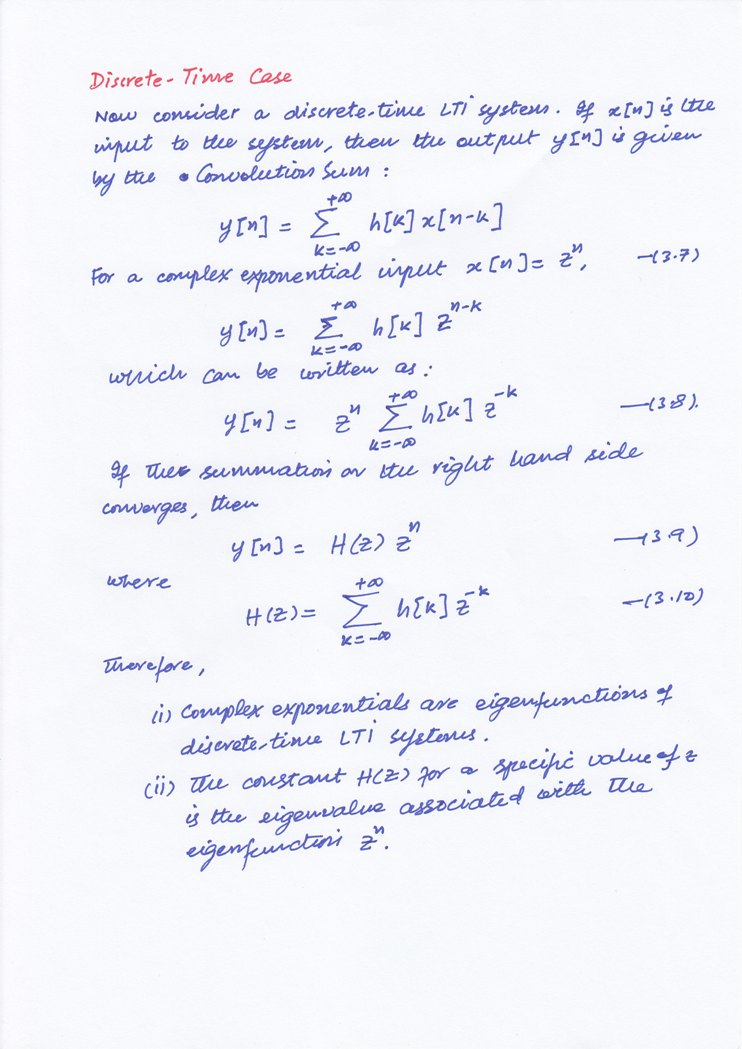
1. **Fourier Series Representation of Periodic Signals**
   1. **Introduction**
   2. **A Historical Perspective**
   3. **The Response of LTI Systems to Complex Exponentials**
   4. **Fourier Series Representation of Continuous-Time**

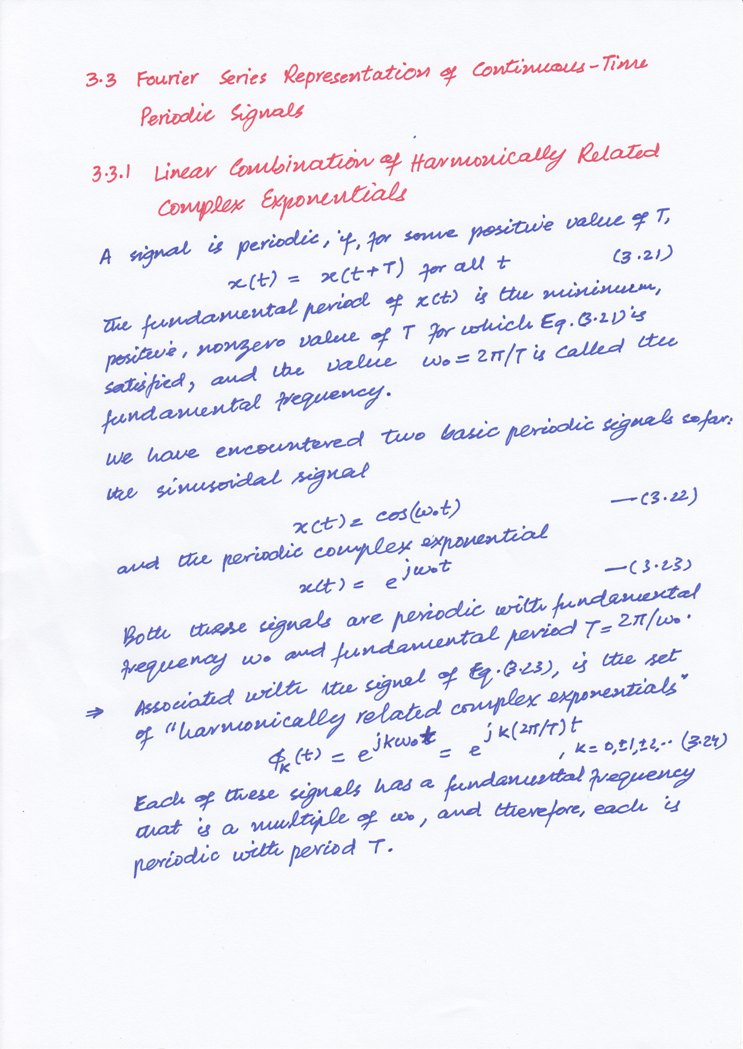
**Periodic Signals**

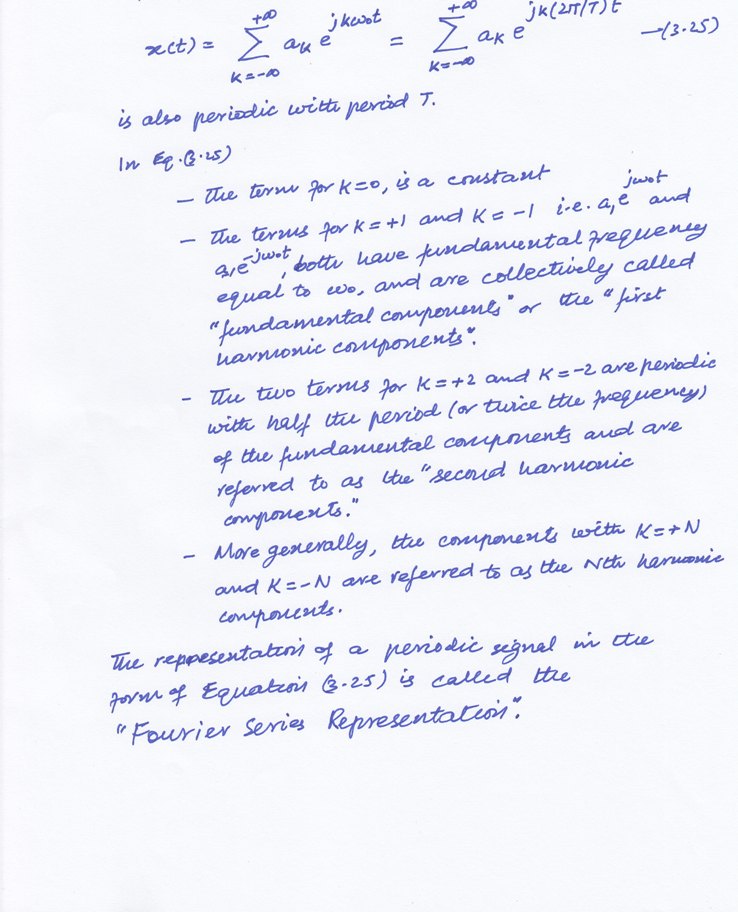
* + 1. Linear Combination of harmonically Related Complex Exponentials
    2. Determination of the Fourier Series Representation of a Continuous-Time Periodic Signal
  1. **Convergence of Fourier Series**
  2. **Properties of Continuous-Time Fourier Series**
     1. Linearity
     2. Time Shifting
     3. Time Reversal
     4. Time Scaling
     5. Multiplication
     6. Conjugation and Conjugate Symmetry
     7. Parseval’s Relation for Continuous-Time Periodic Signals
     8. Summary of Properties of the Continuous-Time Fourier Series
     9. Examples
  3. **Fourier Series Representation of Discrete-Time Periodic Signals**
     1. Linear Combination of harmonically Related Complex Exponentials
     2. Determination of the Fourier Series Representation of a Periodic Signal
  4. **Properties of Discrete-Time Fourier Series**
     1. Multiplication
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  5. **Fourier Series and LTI Systems**
  6. **Filtering**
     1. Frequency-Shaping Filters
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  7. **Examples of Continuous-Time Filters Described by Differential Equations**
     1. A Simple RC Lowpass Filter
     2. A Simple RC Highpass Filter
  8. **Examples of Discrete-Time Filters Described by Difference Equations**
     1. First-order Recursive Discrete-Time Filters
     2. Non-recursive Discrete-Time Filters
  9. **Summary**

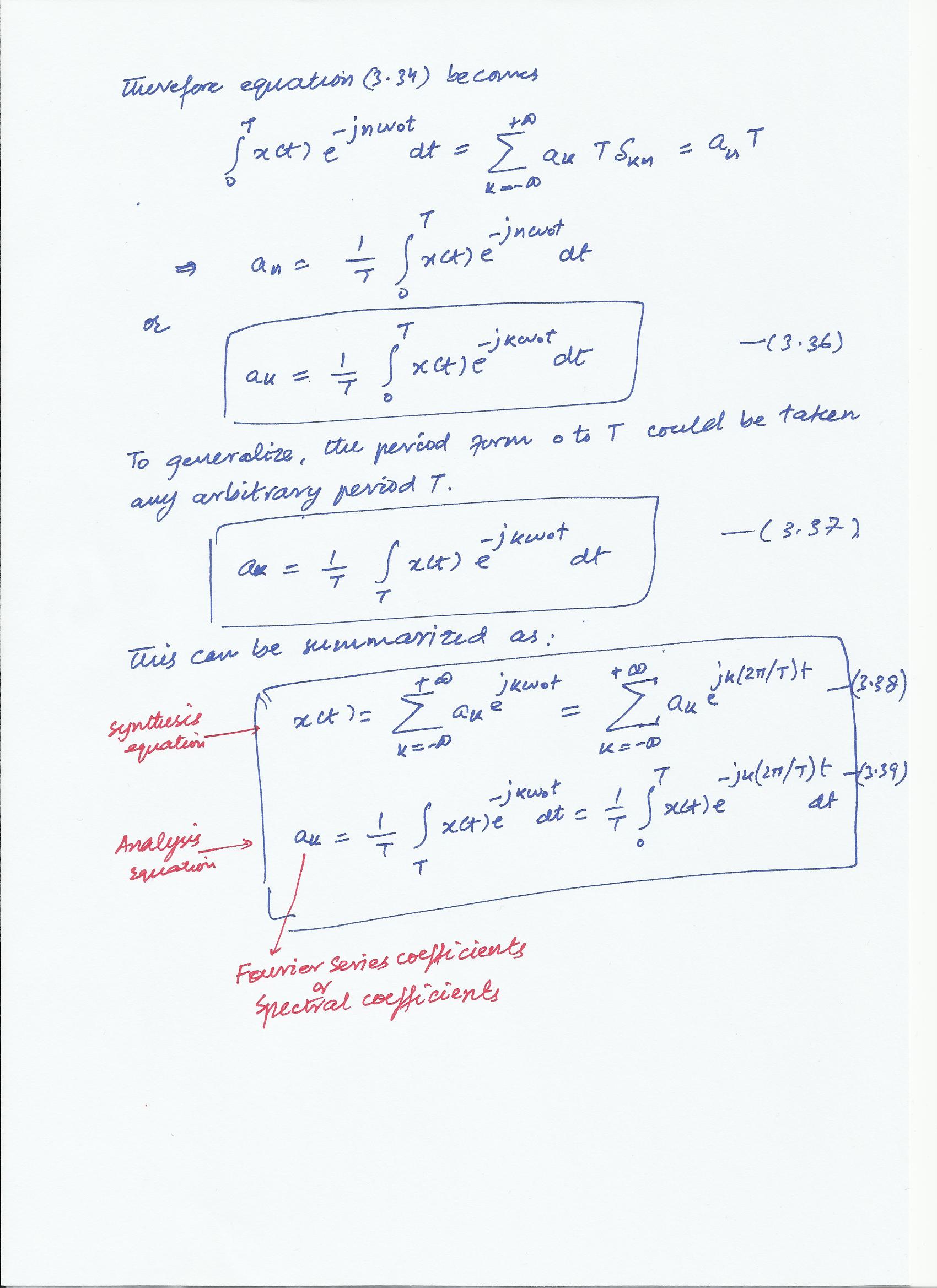
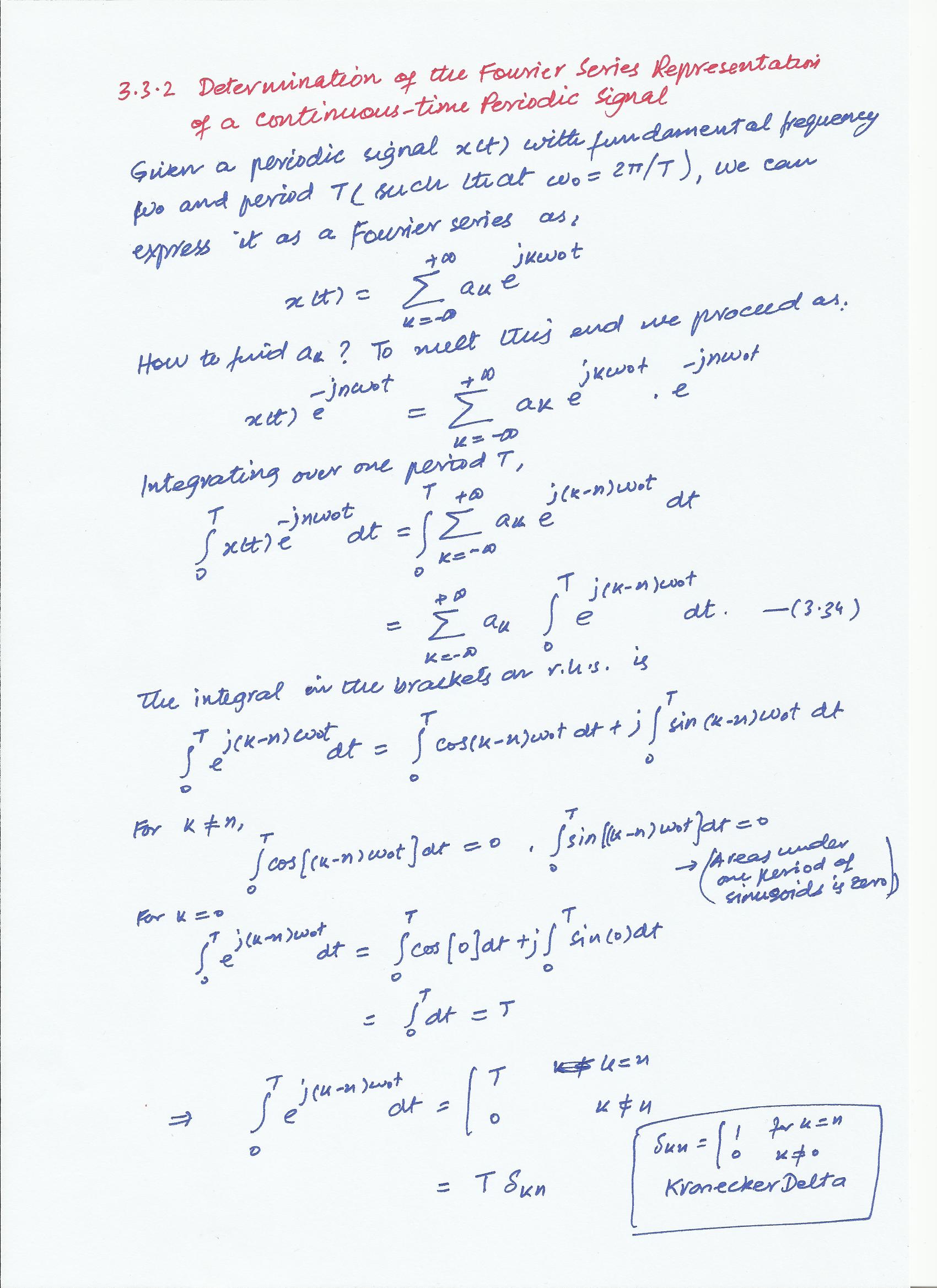
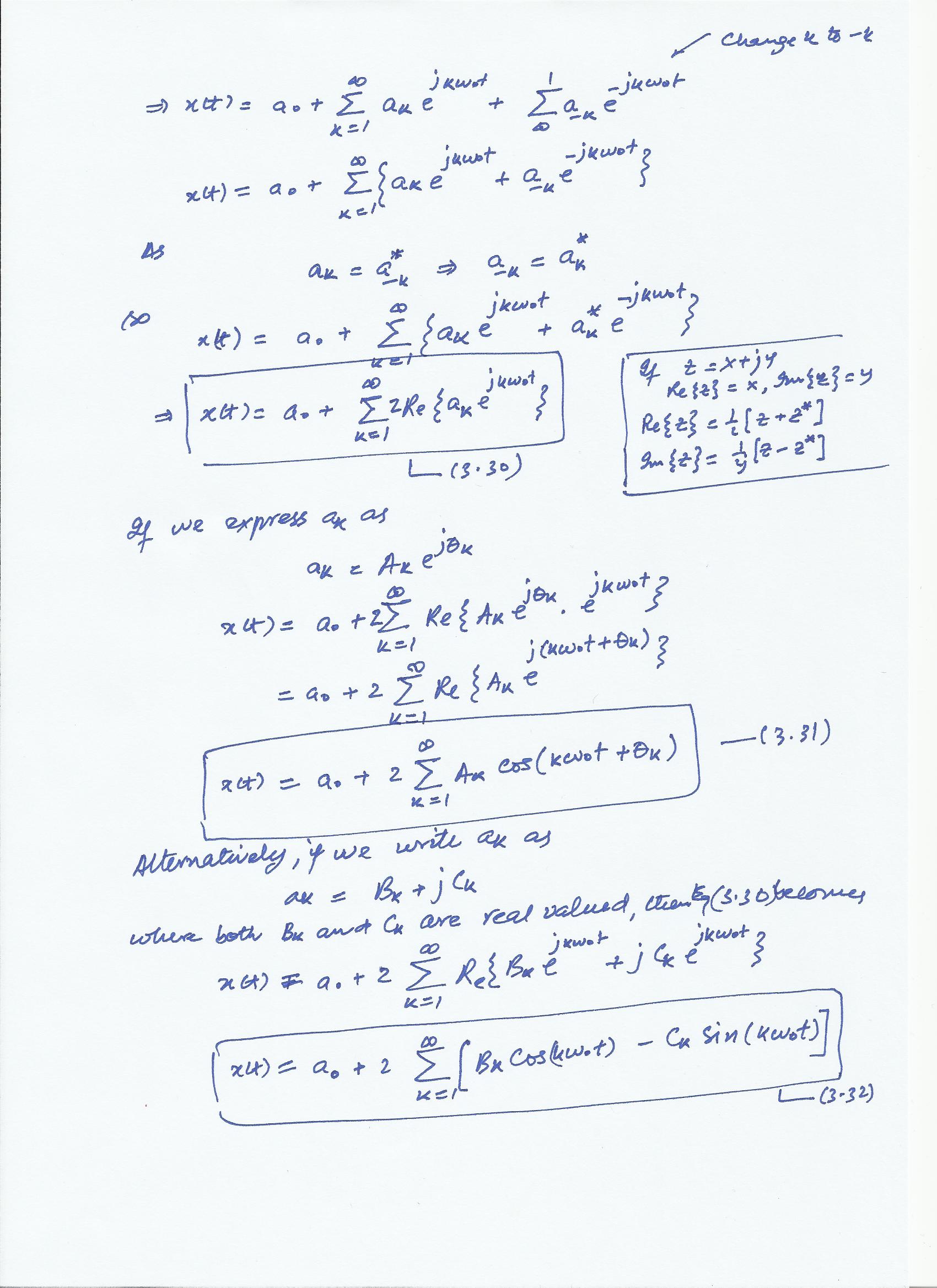
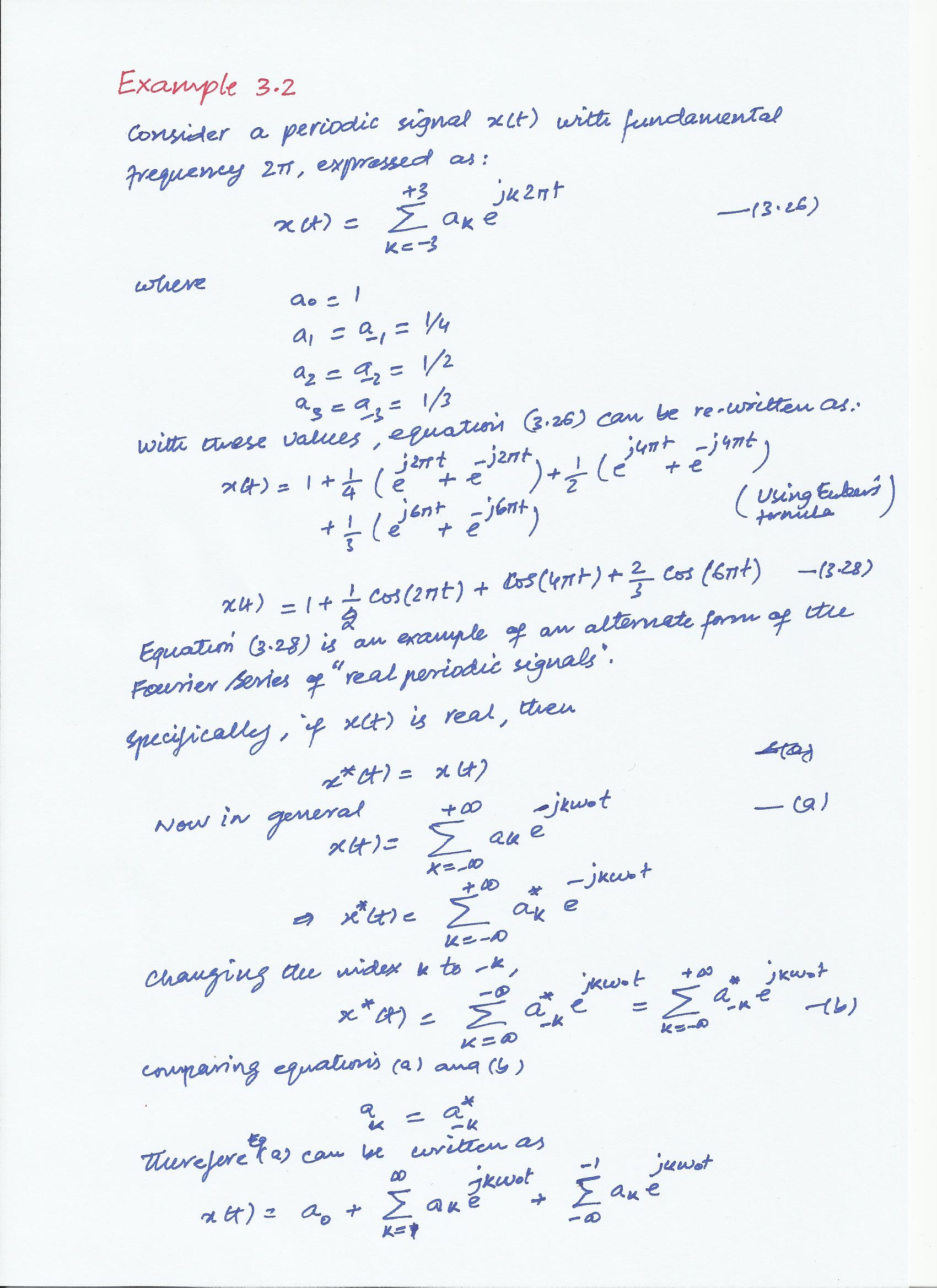






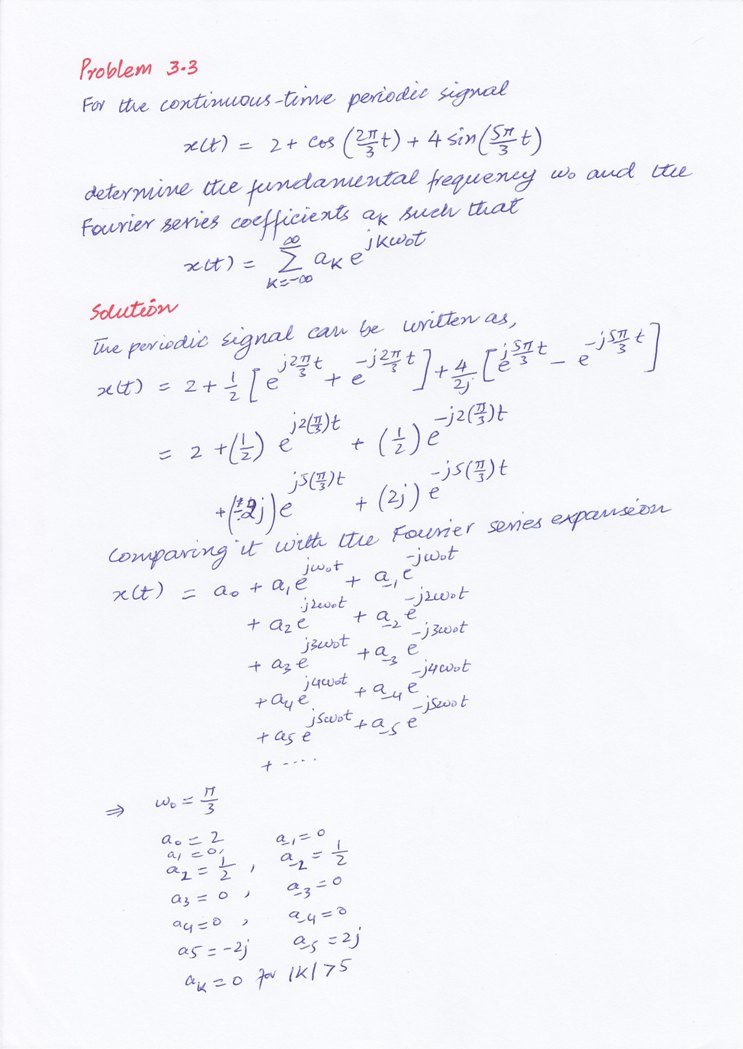
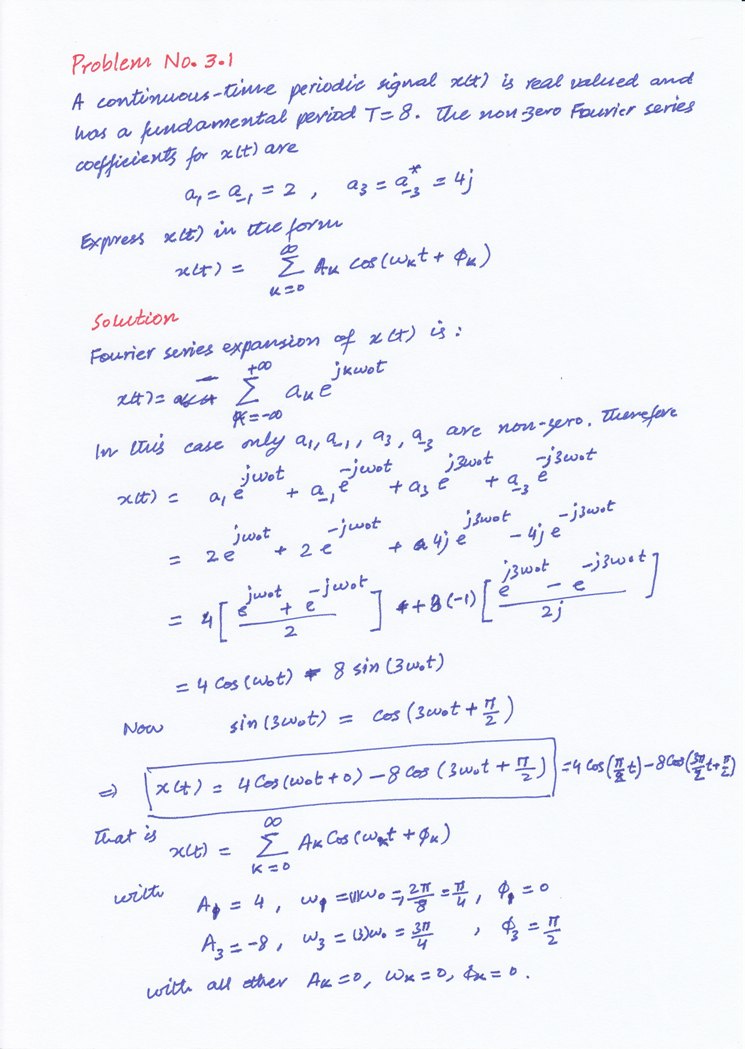
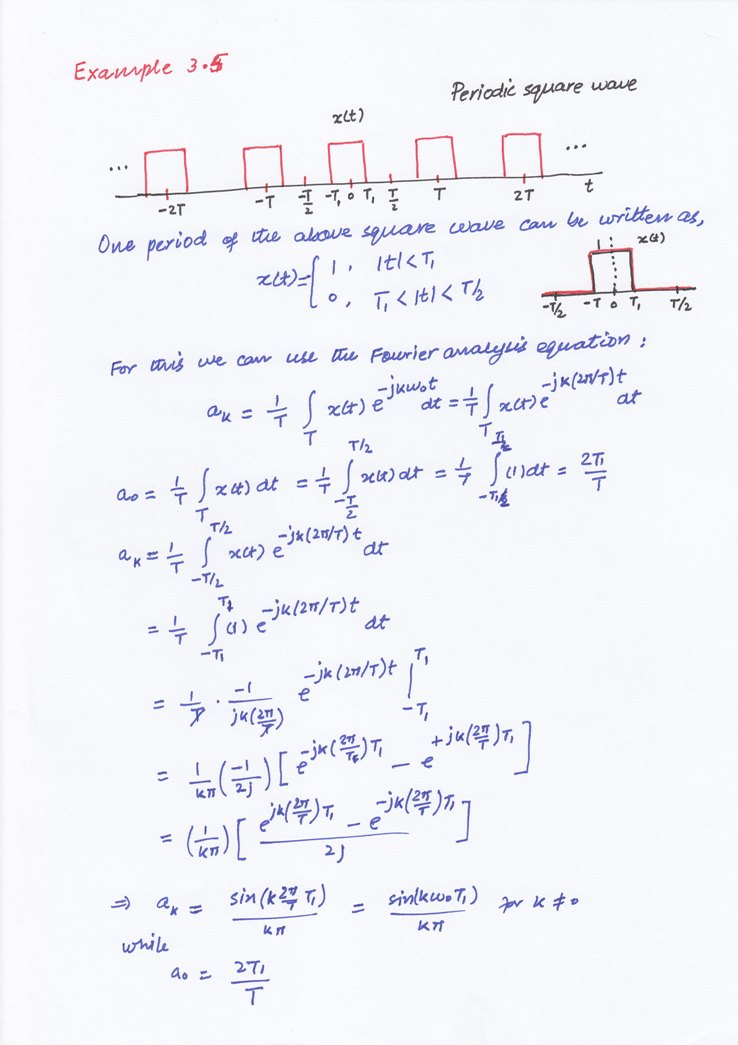
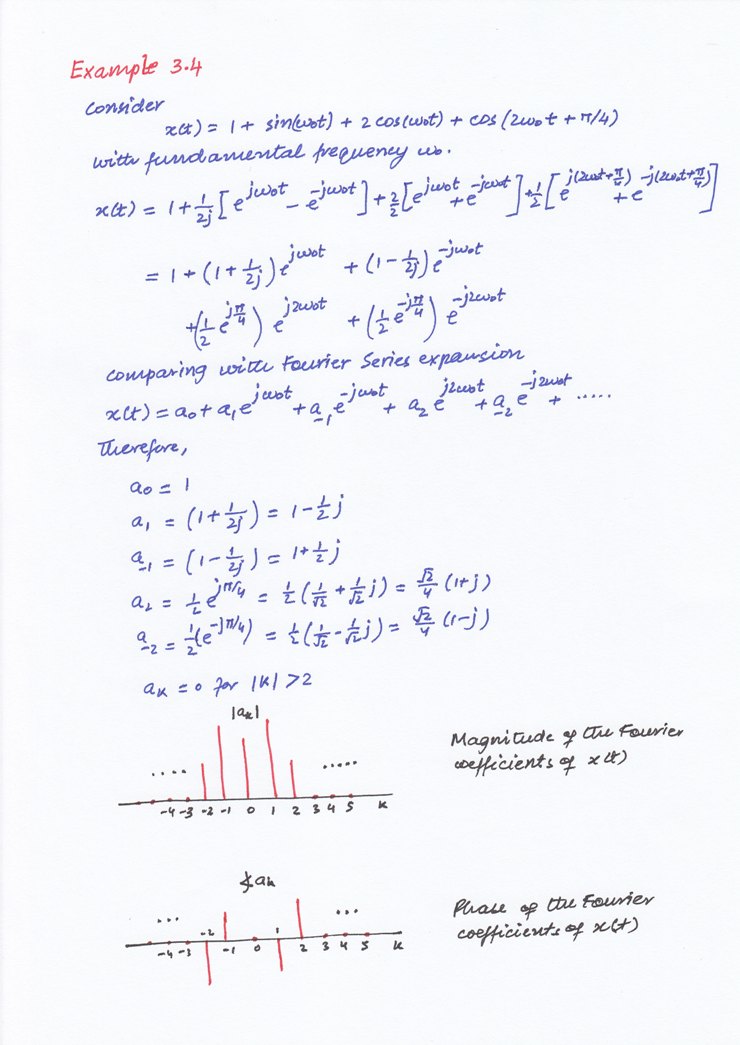
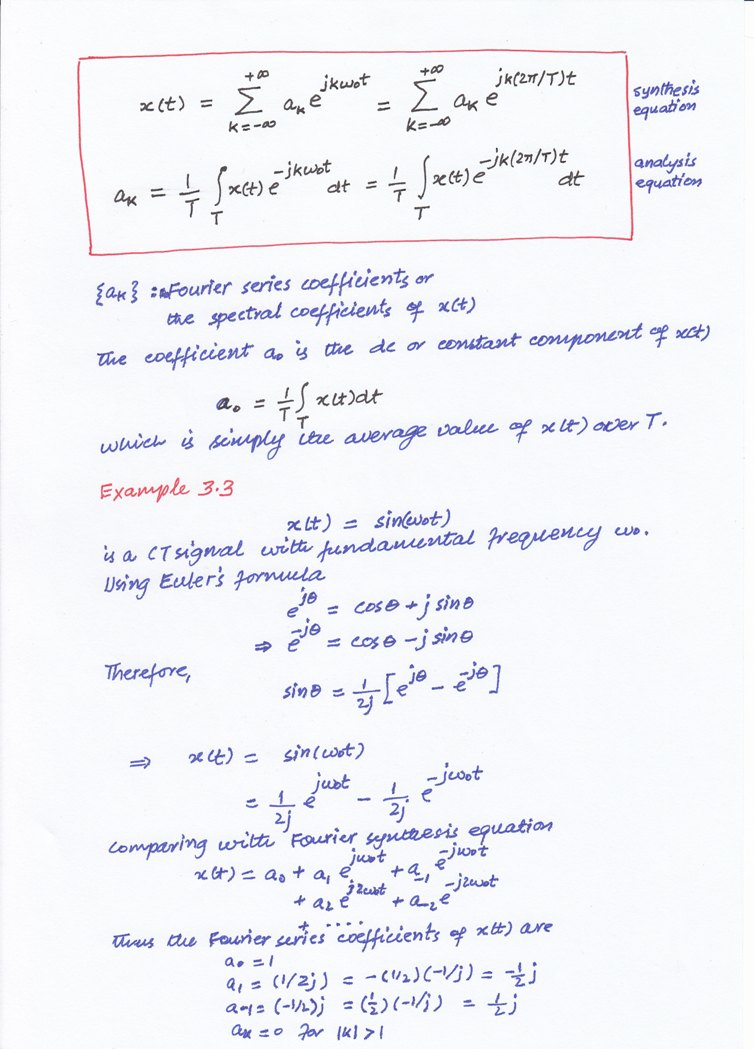






k ≠ n

k = n



a0 =0 n

* 1. **Properties of Continuous-Time Fourier Series**

|  |  |  |
| --- | --- | --- |
|  | **Synthesis Equation** | (3.38) |
|  | **Analysis Equation** | (3.39) |

**TABLE 3.1** PROPERTIES OF CONTINUOUS-TIME FOURIER SERIES

|  |  |  |
| --- | --- | --- |
| Property | Periodic Signal | Fourier Series Coefficients |
|  |  |  |
| Linearity |  |  |
| Time Shifting |  |  |
| Frequency Shifting |  |  |
| Conjugation |  |  |
| Time Reversal |  |  |
| Time Scaling |  |  |
| Periodic Convolution |  |  |
| Multiplication |  |  |
| Differentiation |  |  |
| Integration |  |  |
| Conjugate Symmetry for Real Signals |  |  |
| Real and Even Signals |  | real and even |
| Real and Odd Signals |  | purely imaginary and odd |
| Even-Odd Decomposition of real Signals |  |  |
| Parseval’s Relation for Periodic Signals | | |

* 1. **Properties of Discrete-Time Fourier Series**

|  |  |  |
| --- | --- | --- |
|  | **Synthesis Equation** | (3.38) |
|  | **Analysis Equation** | (3.39) |

**TABLE 3.1** PROPERTIES OF DISCRETE-TIME FOURIER SERIES

|  |  |  |
| --- | --- | --- |
| Property | Periodic Signal | Fourier Series Coefficients |
|  |  |  |
| Linearity |  |  |
| Time Shifting |  |  |
| Frequency Shifting |  |  |
| Conjugation |  |  |
| Time Reversal |  |  |
| Time Scaling |  |  |
| Periodic Convolution |  |  |
| Multiplication |  |  |
| First Difference |  |  |
| Running Sum |  |  |
| Conjugate Symmetry for Real Signals |  |  |
| Real and Even Signals |  | real and even |
| Real and Odd Signals |  | purely imaginary and odd |
| Even-Odd Decomposition of real Signals |  |  |
| Parseval’s Relation for Periodic Signals | | |

