1. System Response Methods
2. Frequency Response Method
   1. Empirical Transfer-function Identification
      1. Sine wave testing

* Motivation: Using sampled input of , and the output

, find . So In order to get “Bode-plot”, we need infinite

* + 1. Discrete Fourier Transform of Signals
* **The Discrete Fourier Transform(DFT)**

-. sampled at

where

-. For

Hence for a is the period of

* Question: what is the maximum frequency of (3.1)?
* Ex.3.1 Sine-wave signal

-. Given

where and

-. Find when

Hence

For simplification, using the following relationship:

so that

* Periodogram: the plot of values of
  + 1. Empirical Transfer Function Estimate
* Empirical Transfer Function Estimate(ETFE) for Samples systems
* For LTI

Now for a sampled system, , the estimate of is

* The empirical transfer function estimator
* Ex. 3.2 : Empirical Transfer Function Estimator : matlab test…
  + 1. (skip) Critical point identification:
* In a system with a relay, which is not a linear component, hence the system is a non-linear system.
* Sometimes stable limit cycle oscillations
* What is the limit cycle? 🡪 we should learn in non-linear (control) system.
* Skip and later study
  1. Discrete-time Transfer Function
     1. z-transform
* Discrete Fourier transfer function of a sampled system
* z-transform
* as a Laplace transform goes to 0 to ,
* transfer function in domain

Then the z-transform of



* + 1. Impulse response identification using Input-output data

For t=0



In matrix form

* Shift operator
  + 1. Discrete-time Delta operator