Dependent Variables for Signals

- Single

- Multiple Channels

Color coding for TV, digital images, & printing

- Red R

- Green G

- Blue B

- Hue H

- Saturation S

- Value V

- Cyan C

- Magenta M

- Yellow Y

- Black K

Complex Numbers: Two-channel data

- Cartesian, rectangular

- Real & Imaginary

- Polar

- Magnitude & Angle

Notation (Signals)

v parenthesis: independent vars are continuous

g ( )

^dep. var

“Lower case” variable means time or sequential description of data

g [ ] <- square brackets: independent vars are discrete (integers)

G ( ) <- parenthesis: independent variables are continuous

^ upper case dependent variable is a function of either frequency, s-domain, z-domain, or phasor

G [ ] <- square brackets: independent variables are discrete (integers)

Book:

(omega) = radial frequency = 2piF

F = cyclic frequency (Hz)

Complex Numbers:

- 600 years old!!!!!!!!!!!

- Developed to find N roots of the Nth order polynomial

- We use complex numbers in EE to manage derivative & integral calculations (Euler’s method)

- Notation: “Flag” to indicate imaginary part of complex number

Math & Physics: **i = sqrt(-1)** = i \* 1

For EE: i is used for current, so **j = sqrt(-1)**

Why is “i” used for current?

- Andre-Marie Ampere: “Intensite de comrant”

Z = a + jb

Z = complex number

a = real part

b = imaginary part

Complex Conjugate:

conj {z} = conj {a + jb} = z\*

z = a + jb

z\* = a – jb

z & z\* have same real part, and same magnitude imaginary part with opposite signs

z + z\* = 2 \* {z}

Stuff to remember

1/j = -j

(1/j) \* (j) = 1

(-j) \* (j) = 1



Sqrt(j) = ?

- Need polar coordinate version of complex numbers & Euler identity to solve this

M = sqrt(a^2 + b^2) = sqrt(z \* z\*) theta = tan^-1(b / a) PAY ATTENTION TO QUADRANTS

