CS 530 Midterm 1 Cheatsheet

Complex Analysis

$z = a + ib = re^{i\theta} = r(cos(\theta) + isin(\theta))$
$\overline{z} = a - bi = re^{-i\theta}$
$|z| = \sqrt{a^2 + b^2}$
$\|\mathbf{z}\| = \sqrt{|z_1|^2 + \cdots + |z_n|^2}$

Fourier Transform

$$\hat{z}(m) = \sum_{n=0}^{N-1} z(n) e^{-2\pi i \frac{mn}{N}}$$

$$z(n) = \frac{1}{N} \sum_{m=0}^{N-1} \hat{z}(m) e^{-2\pi i \frac{mn}{N}}$$

2D

$$\hat{z}(m_1, m_2) = \frac{1}{\sqrt{N_1 N_2}} \sum_{n_1=0}^{N_1-1} \sum_{n_2=0}^{N_2-1} z(n_1, n_2) e^{-2\pi i \frac{m_1 n_1}{N_1}} e^{-2\pi i \frac{m_2 n_2}{N_2}}$$

$$z(n_1, n_2) = \frac{1}{\sqrt{N_1 N_2}} \sum_{m_1=0}^{N_1-1} \sum_{m_2=0}^{N_2-1} \hat{z}(m_1, m_2) e^{2\pi i \frac{m_1 n_1}{N_1}} e^{2\pi i \frac{m_2 n_2}{N_2}}$$

Wavelets

text

Misc

$$\sum_{k=a}^{b} r^k = \frac{r^a - r^{b+1}}{1 - r}$$