

# 情報通信工学 2 よく使う数学公式

## 1 三角関数

### 1.1 積和

$$\cos A \cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)] \quad (1)$$

$$\sin A \sin B = -\frac{1}{2}[\cos(A+B) - \cos(A-B)] \quad (2)$$

$$\sin A \cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)] \quad (3)$$

$$\cos A \sin B = \frac{1}{2}[\sin(A+B) - \sin(A-B)] \quad (4)$$

特例:  $A = B$

$$\cos A \cos A = \frac{1}{2}[\cos 2A + 1] \quad (5)$$

$$\sin A \sin A = -\frac{1}{2}[\cos 2A - 1] \quad (6)$$

$$\sin A \cos A = \cos A \sin A = \frac{1}{2} \sin 2A \quad (7)$$

### 1.2 加法定理

$$\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta \quad (8)$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta \quad (9)$$

$$(10)$$

### 1.3 直交座標・極座標

$$a \cos \Omega + b \sin \Omega = c \cos(\Omega + \phi) \quad (11)$$

但し

$$c = \sqrt{a^2 + b^2} \quad (12)$$

$$\phi = -\arctan \frac{a}{b} \quad (13)$$

## 2 指数関数

$$\exp[x] \exp[y] = \exp[x+y] \quad (14)$$

$$\exp[jx] = \cos x + j \sin x \quad (15)$$

$$\exp[-jx] = \cos x - j \sin x \quad (16)$$

$\alpha = a + jb$  とする

$$\alpha \exp[jx] = [a \cos x - b \sin x] + j[a \sin x + b \cos x] \quad (17)$$

$$\alpha \exp[-jx] = [a \cos x + b \sin x] + j[-a \sin x + b \cos x] \quad (18)$$

### 3 複素数

$\alpha = a + jb, \beta = c + jd$  とする

$$\alpha\beta^* = [\alpha^*\beta]^* \quad (19)$$

$$\alpha\beta^* = (ac + bd) + (bc - ad)j \quad (20)$$

$$\alpha^*\beta = (ac + bd) - (bc - ad)j \quad (21)$$

$$\alpha^*\beta + \alpha\beta^* = 2\Re[\alpha\beta^*] \quad (22)$$

$$\alpha^*\beta - \alpha\beta^* = 2j\Im[\alpha\beta^*] \quad (23)$$

$$[\alpha\beta]^* = \alpha^*\beta^* \quad (24)$$

$$\alpha\beta = (ac - bd) + (bc + ad)j \quad (25)$$

$$\alpha^*\beta^* = (ac - bd) - (bc + ad)j \quad (26)$$

### 4 その他

$\omega = 2\pi/T$  とすると,

$$\int_{-T/2}^{T/2} \exp(-jn\omega t) dt = \begin{cases} T & \text{if } n = 0 \\ 0 & \text{if } n \neq 0 \end{cases} \quad (27)$$