Reële ruimte:

* Complexe stromen en spanningen
* Cartesische coördinaten (x, y)
* Polair (hoek fi, straal r)
  1. X = r cos(fi)
  2. Y = r sin(fi)

Complexe ruimte (Zie schrift w3.2):

* Cartesisch:
  1. V = [Re] + [Im]j
* Polair:
  1. X = |v| cos(fi)
  2. Y = |v| sin(fi)
  3. V = |v| cos(fi) + |v| sin(fi)j
  4. V = |v|(cos(fi) + j sin(fi))
* Exponentiele vorm
  1. V = |v| e^(j fi)

|x| = norm / modulus = lengte van de vector = sqrt(x^2 + y^2)

Formule van euler: e^(j fi) = cos(fi) + j sin(fi)

* Omzetten reele signalen naar de complexe vorm
  1. Zet signaal om naar de cosinus vorm
  2. Stel t = 0
  3. Bepaal amplitude en fase
  4. Druk signaal uit in de complexe vorm
     + Cartesische vorm
     + Poolvorm
     + Exponentiele vorm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signaal | Cosinus vorm | Amplitude | Fase | Complexe vorm |
| Sin(wt) | Cos(wt - 0.5pi) | 1 | -0.5pi | 1e^( j \* 0.5pi) =  Cos(-0.5pi) + j sin(0.5pi) =  1 (0-j) = -j |
| Cos(wt) | Cos(wt) | 1 | 0 | 1e^(j0) =  1(cos 0 + j sin 0) =  1 |
| Sin(wt + pi) | Cos(wt + 0.5pi) | 1 | 0.5pi | 1e^(j \* 0.5pi) =  1(cos(0.5pi) + j sin(0.5pi)) =  0 + 1j |
| Cos(wt + pi) | Cos(wt + pi) | 1 | Pi | 1e^(j \* pi) =  1(cos(pi) + j sin(pi)) =  -1 + 0j = -1 |
| Cos(wt + 0.25pi) | Cos(wt + 0.25pi) | 1 | 0.25pi | 1e^(j \* 0.25pi) =  Cos(0.25pi) + j sin(0.25pi)=  0.5sqrt(2) + 0.5sqrt(2) \* j |
| Sin(wt + pi/4) | Cos(wt – pi/4) | 1 | -pi/4 | 1e^(j \* -pi/4) =  cos(-pi/4) + j sin(-pi/4) =  0.5sqrt(2) - 0.5sqrt(2) \* j |
| Cos(wt + 3pi/4) | Cos(wt + 3pi/4) | 1 | 3pi/4 | 1e^(j \* 3pi/4) =  Cos(3pi/4) + j sin(3pi/4) =  -0.5sqrt(2) + 0.5sqrt(2) \* j |
| Sin(wt – pi/4) | Cos(wt – 3pi/4) | 1 | -3pi/4 | 1e^(j \* -3pi/4) =  Cos(-3pi/4) + j sin(-3pi/4) =  -0.5sqrt(2) - 0.5sqrt(2) \* j |

U(t) = 12sin(100 \* pi \* t + 0.23)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Signal | Cosinus | Amplitude | Fase | Complexe vorm |
| 12sin(100 \* pi \* t + 0.23) | 12sin(100 \* pi \* t + 0.23 – 0.5pi) | 12 | 0.23 – 0.5pi | 12e^(j \* -1.34) V =  12(Cos(-1.34) + j sin(-1.34)) V =  2.76 + -11.64j V |

* Omzetten complexe vorm naar reele vorm
  1. u = sqrt([Re]^2 + [Im]^2)
  2. Fi = arctan([Im]/[Re])

|  |  |  |  |
| --- | --- | --- | --- |
| Complex getal | Modulus | Argument | u(t) |
| 1 | 1 | 0 | 1 \* cos(wt + 0) 🡪 cos(wt) V |
| 1 + j | Sqrt(2) | Cos(1/1) = pi/4 | Sqrt(2) \* cos(wt + pi/4) V |
| J | 1 | cos(1/0) = pi/2 | Cos(wt + pi/2) V |
| -1 + j | Sqrt(2) | Cos(1/-1) = -pi/4 = pi – pi/4 = 3pi/4 | Sqrt(2) \* cos(wt + 3pi/4) |
| -1 | 1 | Cos(0 /-1) + pi = pi | Cos(wt + pi) 🡪 -cos(wt) |
| -1 -j | Sqrt(2) | Cos(-1/-1) + pi = 5pi/4 | sqrt(2) Cos(wt + 5pi/4) 🡪 sqrt(2) cos(wt – 3pi/4) |
| -j | 1 | Cos(-1 / 0) = -pi/2 | Cos(wt – pi/2) 🡪 sin(wt) |
| 1 – j | Sqrt(2) | Cos(-1/1) = pi/4 | Sqrt(2) cos(wt + pi/4) |

Z = [Re] + [Im]j

**Als [Re] < 0 dan [Re] += pi**

Zie scrhift week 3.2