```
c2d  Converts continuous-time dynamic system to discrete time.

    SYSD = c2d(SYSC,TS,METHOD) computes a discrete-time model SYSD with
    sample time TS that approximates the continuous-time model SYSC.
    The string METHOD selects the discretization method among the following:
       'zoh'           Zero-order hold on the inputs
       'foh'           Linear interpolation of inputs
       'impulse'       Impulse-invariant discretization
       'tustin'        Bilinear (Tustin) approximation.
       'matched'       Matched pole-zero method (for SISO systems only).
       'least-squares' Least-squares minimization of the error between
                       frequency responses of the continuous and discrete
                       systems (for SISO systems only).
    The default is 'zoh' when METHOD is omitted. The sample time TS should
    be specified in the time units of SYSC (see "TimeUnit" property).

    c2d(SYSC,TS,OPTIONS) gives access to additional discretization options.
    Use C2DOPTIONS to create and configure the option set OPTIONS. For
    example, you can specify a prewarping frequency for the Tustin method by:
       opt = c2dOptions('Method','tustin','PrewarpFrequency',.5);
       sysd = c2d(sysc,.1,opt);


    Documentation for c2d
    Other functions named c2d

>>
```

Stabilität zeitdiskreter Systeme (4)

Pole kontinuierlicher und zeitdiskreter Systeme

Aus

$$z = e^{sT} \quad \textbf{mit} \quad s = \sigma + j\omega$$

folgt

$$|z| = |e^{(\sigma + j\omega)T}| = |e^{\sigma T}| \cdot |e^{j\omega T}| = e^{\sigma T}$$

$$|e^{j\omega T}| = |\cos\omega T + j\sin\omega T| = \sqrt{\cos(\omega T)^2 + \sin(\omega T)^2} = 1$$

und

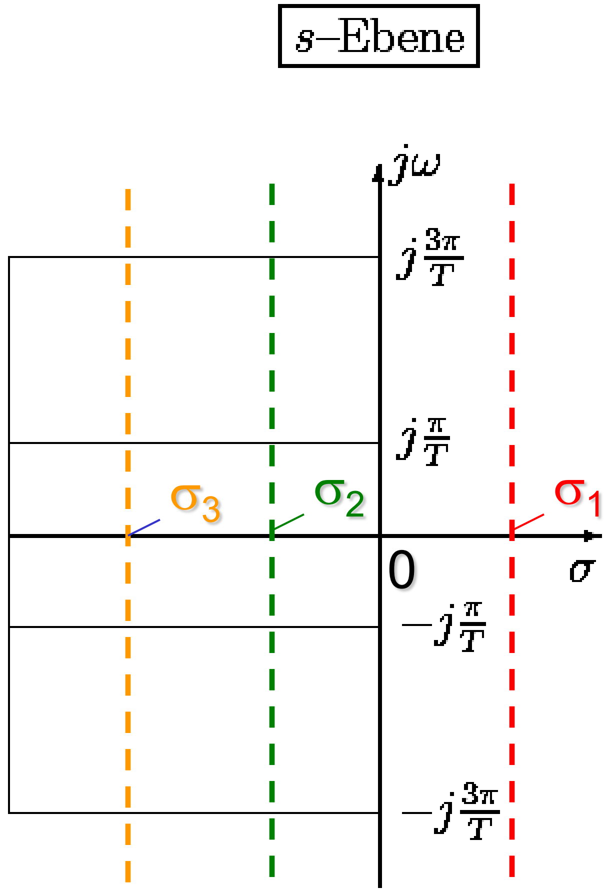
$$\arg z = \varphi = \omega T$$

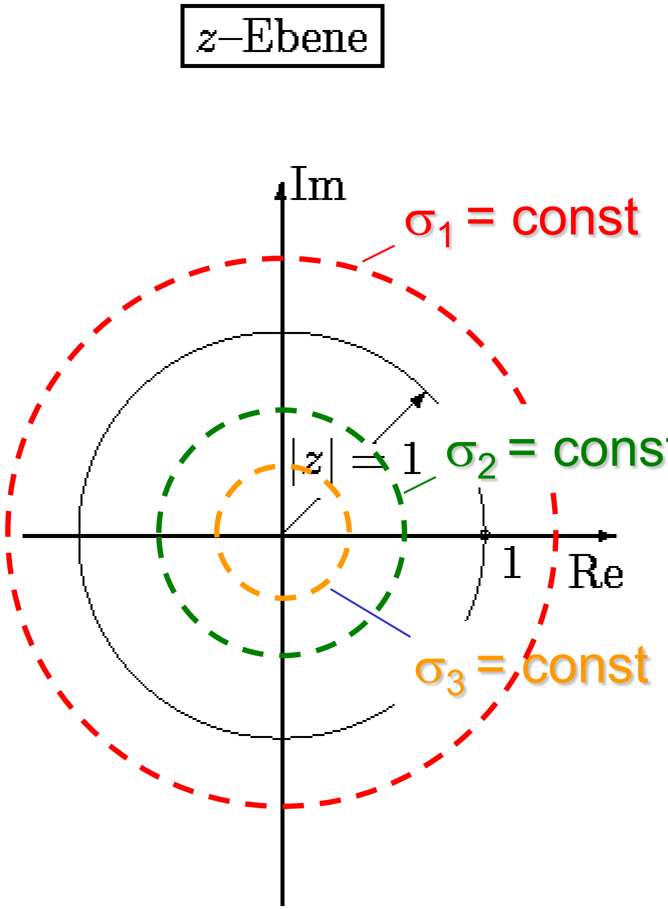
- **Für eine konstantes Abtastintervall T hängt der Betrag von z nur vom Realteil σ ab.**
- **Das Argument von z wird nur von ω bestimmt.**

Stabilität zeitdiskreter Systeme (5)

Linien mit σ = const (absolute Stabilitätsreserve)

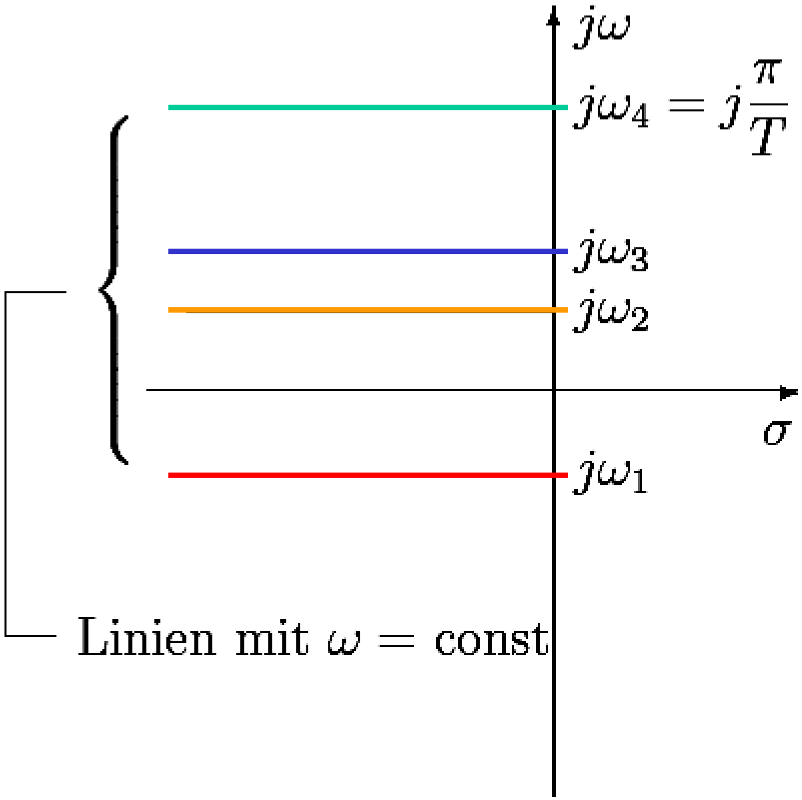
Kreise mit dem Radius $e^{\sigma T}$

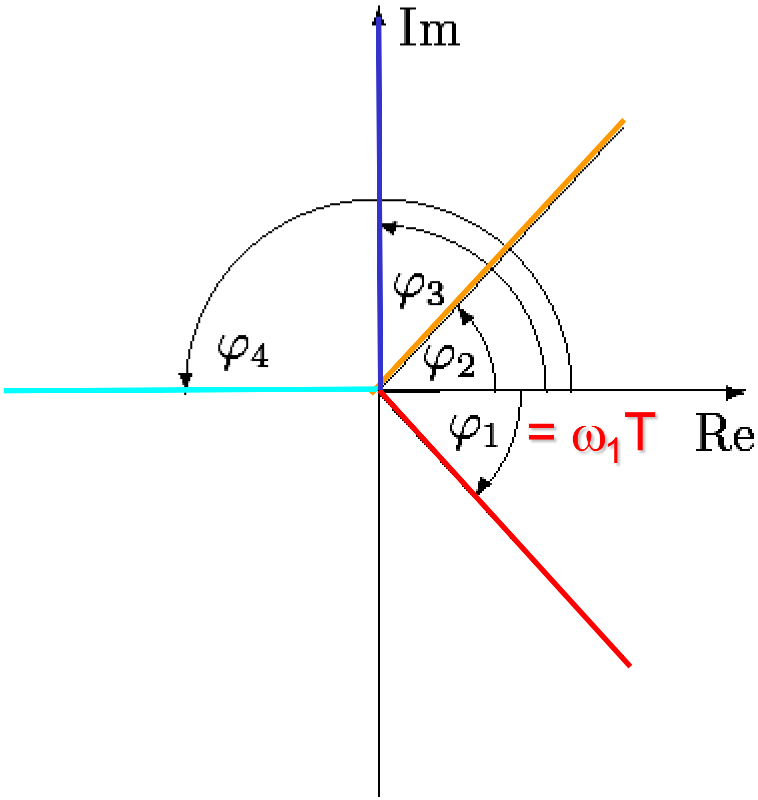




Stabilität zeitdiskreter Systeme (6)

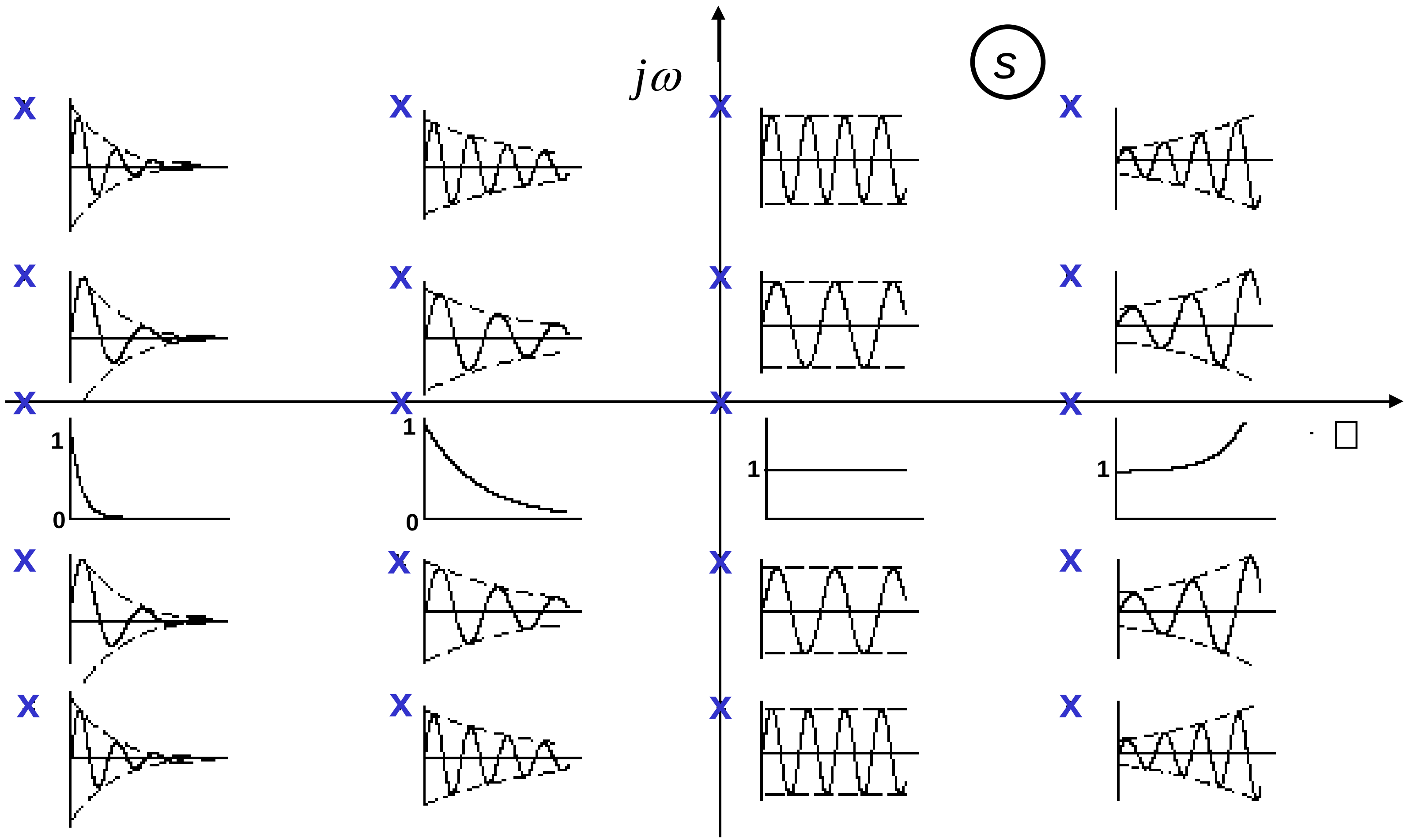
Linien mit ω = const | **Geraden mit Winkel ωT**





Nr.	Zeitfunktion $f(t)$	$F(s) = \mathcal{L}\{f(t)\}$	$F(z) = \mathcal{Z}\{f(kT)\}$
1	δ–Impuls $\delta(t)$	1	1
2	Einheitssprung $1(t)$	$\frac{1}{s}$	$\frac{z}{z-1}$
3	t	$\frac{1}{s^2}$	$\frac{Tz}{(z-1)^2}$
4	t^2	$\frac{2}{s^3}$	$\frac{T^2 z(z+1)}{(z-1)^3}$
5	e^{-at}	$\frac{1}{s+a}$	$\frac{z}{z-e^{-aT}}$
6	te^{-at}	$\frac{1}{(s+a)^2}$	$\frac{Te^{-aT}z}{(z-e^{-aT})^2}$
7	$t^2 e^{-at}$	$\frac{2}{(s+a)^3}$	$\frac{T^2 e^{-aT} z(z+e^{-aT})}{(z-e^{-aT})^3}$
8	$1-e^{-at}$	$\frac{a}{s(s+a)}$	$\frac{(1-e^{-aT})z}{(z-1)(z-e^{-aT})}$
9	$\sin\omega_0 t$	$\frac{\omega_0}{s^2+\omega_0^2}$	$\frac{z\sin\omega_0 T}{z^2-2z\cos\omega_0 T+1}$
10	$\cos\omega_0 t$	$\frac{s}{s^2+\omega_0^2}$	$\frac{z^2-z\cos\omega_0 T}{z^2-2z\cos\omega_0 T+1}$
11	$1-(1+at)e^{-at}$	$\frac{a^2}{s(s+a)^2}$	$\frac{z}{z-1}-\frac{z}{z-c}-\frac{acTz}{(z-c)^2};\quad c=e^{-aT}$
12	$1+\frac{be^{-at}-ae^{-bt}}{a-b}$	$\frac{ab}{s(s+a)(s+b)}$	$\frac{z}{z-1}+\frac{bz}{(a-b)(z-c)}-\frac{az}{(a-b)(z-d)}$ $c=e^{-aT},\quad d=e^{-bT}$
13	$e^{-at}\sin\omega_0 t$	$\frac{\omega_0}{(s+a)^2+\omega_0^2}$	$\frac{cz\sin\omega_0 T}{z^2-2cz\cos\omega_0 T+c^2};\quad c=e^{-aT}$
14	$e^{-at}\cos\omega_0 t$	$\frac{s+a}{(s+a)^2+\omega_0^2}$	$\frac{z^2-cz\cos\omega_0 T}{z^2-2cz\cos\omega_0 T+c^2};\quad c=e^{-aT}$
15	$a^{\frac{t}{T}}$	$\frac{1}{s-(\frac{1}{T})\ln a}$	$\frac{z}{z-a}$

Tabelle 3.3: Korrespondenzentabelle


jω
s
1
0
1
0
1
1

Bitte zur nächsten Vorlesung ausfüllen. Ich werde die Lösung in der nächsten Vorlesung.vorstellen.