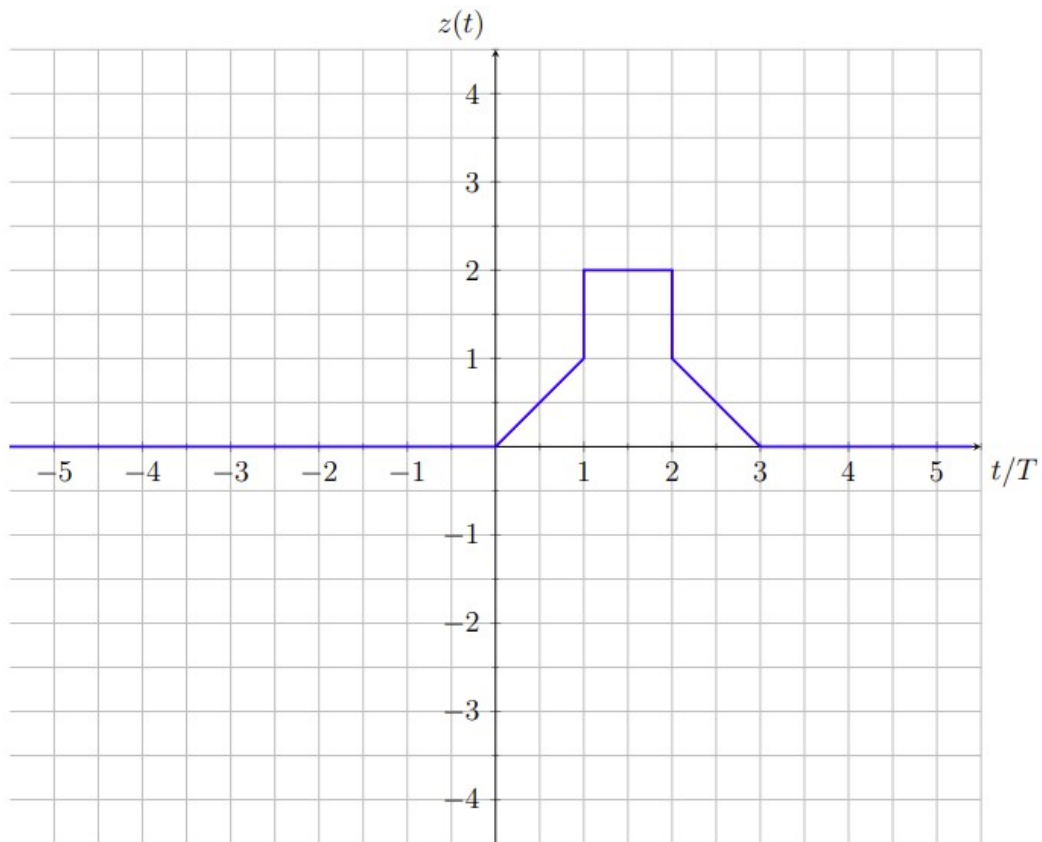


## Sys 1

12%

1. In Abb.1 ist der zeitliche Verlauf des Signals  $z(t)$  dargestellt. **alt Klausur**

Bild 1: Signalverlauf  $z(t)$ Abbildung 1: Signalverlauf  $z(t)$ 

- (a) Bestimmen Sie die abschnittsweise Definition von  $z(t)$

- (b) Berechnen Sie die Energie des Signals  $z(t)$ . Handelt es sich hierbei um ein Energie- oder Leistungssignal ?
- (c) Bestimmen Sie für das in Bild 2 dargestellte System S das Ausgangssignal  $y(t)$  in Abhängigkeit des Eingangssignal  $x(t)$ .



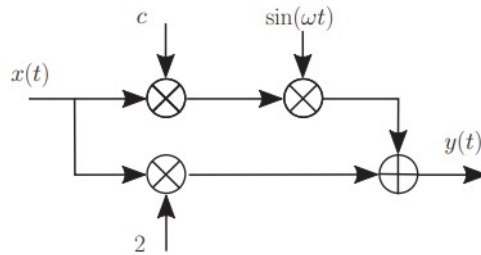


Abbildung 2: Blockdiagram

12% 2. Summe Berechnen

$$\sum_{n=1}^{\infty} \left(\frac{1}{3}\right)^n$$

(a)  $\sum_{n=0}^9 e^{j\pi n/2}$

(b)  $\sum_{n=-2}^7 e^{j\pi n/2}$

(c)  $\sum_{n=0}^{\infty} \left(\frac{1}{2}\right)^n e^{j\pi n/2}$

(d)  $\sum_{n=2}^{\infty} \left(\frac{1}{2}\right)^n e^{j\pi n/2}$

(e)  $\sum_{n=0}^9 \cos\left(\frac{\pi}{2}n\right)$

(f)  $\sum_{n=0}^{\infty} \left(\frac{1}{2}\right)^n \cos\left(\frac{\pi}{2}n\right)$

Abbildung 3: Summe Berechnen

12% 3. Integrale Berechnen

(a)  $\int_0^4 e^{j\pi t/2} dt$

(b)  $\int_0^6 e^{j\pi t/2} dt$

(c)  $\int_2^8 e^{j\pi t/2} dt$

(d)  $\int_0^{\infty} e^{-(1+j)t} dt$

(e)  $\int_0^{\infty} e^{-t} \cos(t) dt$

(f)  $\int_0^{\infty} e^{-2t} \sin(3t) dt$

Abbildung 4: Integrale Berechnen

## Info2

Boolsche Algebra Übungen (quelle:ocw.mit.edu)

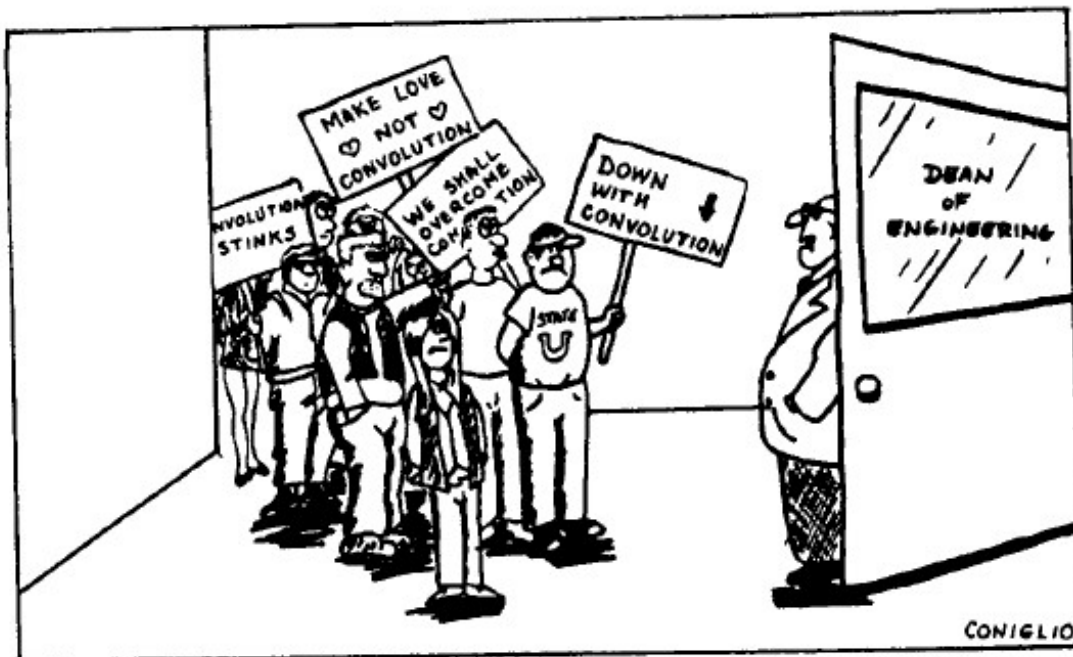


- |  |   |
|--|---|
| 1) $a + 0 =$ _____                             | 14) $y + y\bar{y} =$ _____                    |
| 2) $\bar{a} \cdot 0 =$ _____                   | 15) $xy + x\bar{y} =$ _____                   |
| 3) $a + \bar{a} =$ _____                       | 16) $\bar{x} + y\bar{x} =$ _____              |
| 4) $a + a =$ _____                             | 17) $(w + \bar{x} + y + \bar{z})y =$ _____    |
| 5) $a + ab =$ _____                            | 18) $(x + \bar{y})(x + y) =$ _____            |
| 6) $a + \bar{a}b =$ _____                      | 19) $w + [w + (wx)] =$ _____                  |
| 7) $a(\bar{a} + b) =$ _____                    | 20) $x[x + (xy)] =$ _____                     |
| 8) $ab + \bar{a}b =$ _____                     | 21) $\overline{(\bar{x} + \bar{x})} =$ _____  |
| 9) $(\bar{a} + \bar{b})(\bar{a} + b) =$ _____  | 22) $\overline{(x + \bar{x})} =$ _____        |
| 10) $a(a + b + c + \dots) =$ _____             | 23) $w + (w\bar{x}yz) =$ _____                |
| For (11), (12), (13), $f(a, b, c) = a + b + c$ | 24) $\bar{w} \cdot \overline{(wxyz)} =$ _____ |
| 11) $f(a, b, ab) =$ _____                      | 25) $xz + \bar{x}y + zy =$ _____              |
| 12) $f(a, b, \bar{a} \cdot \bar{b}) =$ _____   | 26) $(x + z)(\bar{x} + y)(z + y) =$ _____     |
| 13) $f[a, b, \overline{(ab)}] =$ _____         | 27) $\bar{x} + \bar{y} + xy\bar{z} =$ _____   |

### Summary of the Graphical Procedure

The procedure for graphical convolution can be summarized as follows:

1. Keep the function  $f(\tau)$  fixed.
2. Visualize the function  $g(\tau)$  as a rigid wire frame, and rotate (or invert) this frame about the vertical axis ( $\tau = 0$ ) to obtain  $g(-\tau)$ .
3. Shift the inverted frame along the  $\tau$  axis by  $t_0$  seconds. The shifted frame now represents  $g(t_0 - \tau)$ .
4. The area under the product of  $f(\tau)$  and  $g(t_0 - \tau)$  (the shifted frame) is  $c(t_0)$ , the value of the convolution at  $t = t_0$ .
5. Repeat this procedure, shifting the frame by different values (positive and negative) to obtain  $c(t)$  for all values of  $t$ .



Convolution: its bark is worse than its bite!

The graphical procedure discussed here appears very complicated and discouraging at first reading. Indeed, some people claim that convolution has driven many electrical engineering undergraduates to contemplate theology either for salvation or as an alternative career ( *IEEE Spectrum*, March 1991, p.60). Actually, the bark

Abbildung 5: