# Travaux Pratiques sur les séries de Fourier

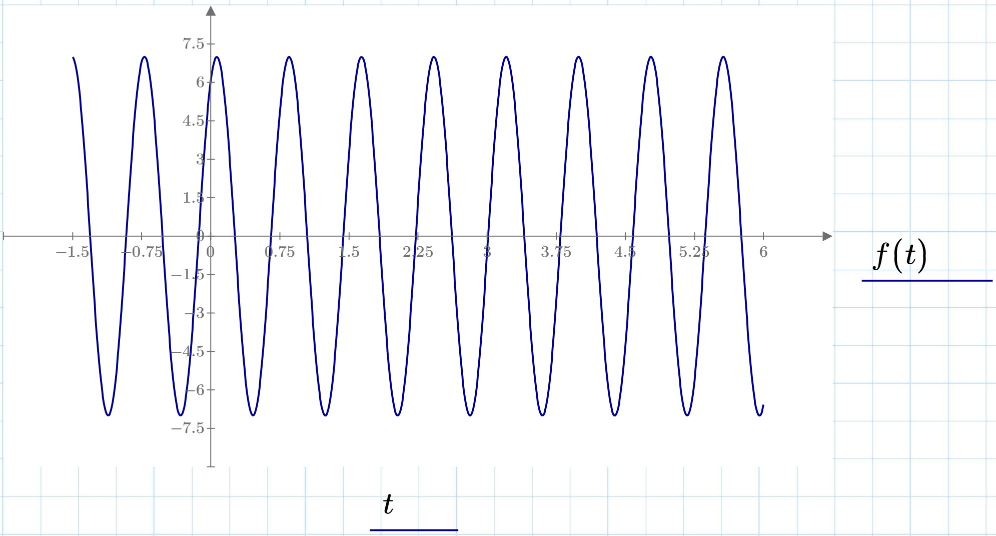
## 1) Prise en main de Mathcad

$$\frac{16-5.2}{\sqrt{3}+4}=1.884$$

$$\frac{16-5.2}{\sqrt{3}+4} \rightarrow \frac{10.8}{\sqrt{3}+4} \qquad \frac{16-5.2}{\sqrt{3}+4} \rightarrow \frac{10.8}{\sqrt{3}+4}$$

$$f(t) := 7 \cdot \sin\left(8 \cdot t + \frac{\pi}{3}\right)$$

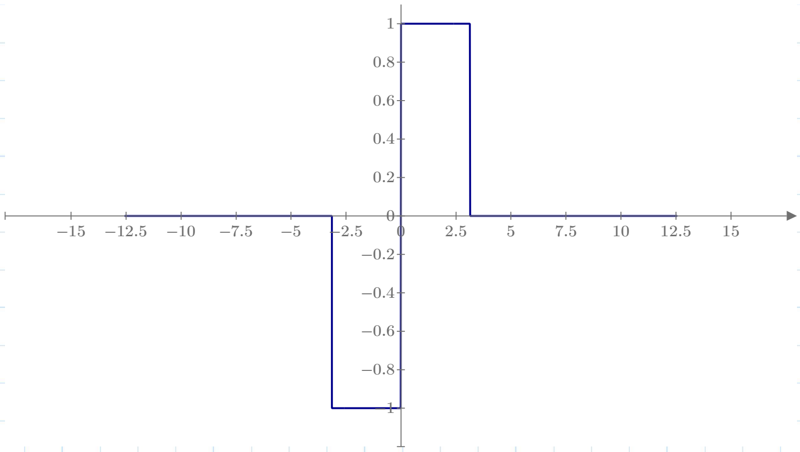
$$t := -1.5, -1.5+0.01 .. 6$$



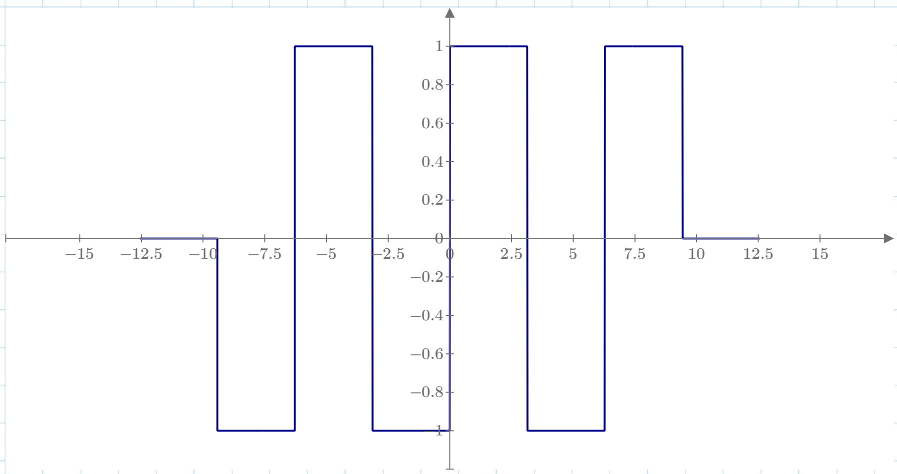

## 2) Résolution de l'exercice page 7 du chapitre 8

$$m(t) := \begin{cases} 0 & \text{if } t < -\pi \\ -1 & \text{if } -\pi \le t < 0 \\ 1 & \text{if } 0 \le t < \pi \\ 0 & \text{if } t \ge \pi \end{cases}$$

$$t := -4 \cdot \pi, -4 \cdot \pi + 0.01 .. 4 \cdot \pi$$




$$x(t) := m(t + 2\cdot\pi) + m(t) + m(t - 2\cdot\pi)$$




Coefficients de Fourier de x

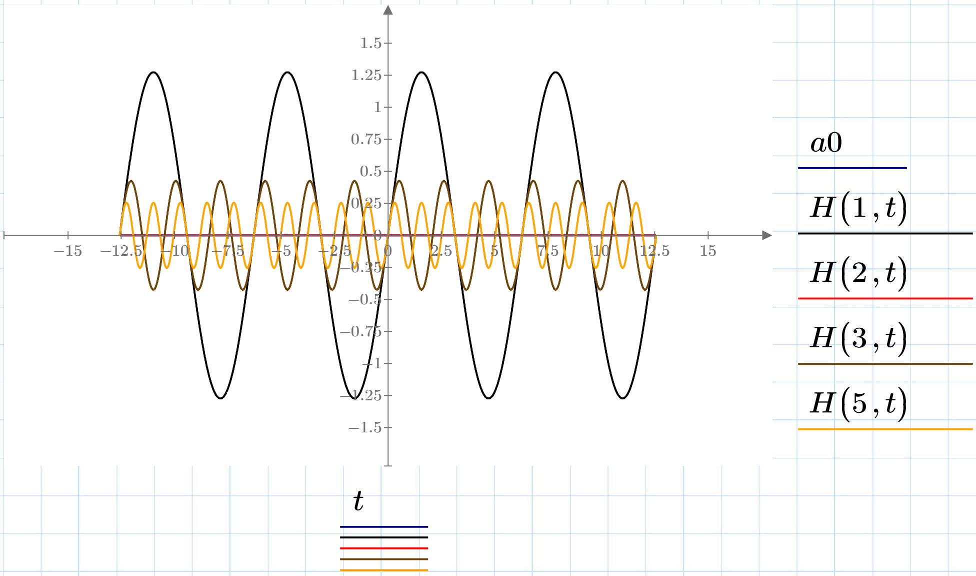
$T := 2\cdot\pi$ $\qquad\omega := 2\cdot\dfrac{\pi}{T}$ $\qquad t0 := 0$

$$a0 := \frac{1}{T}\cdot\int_{t0}^{t0+T} x(t)\,\mathrm{d}t \qquad a(n) := \frac{2}{T}\cdot\int_{t0}^{t0+T} x(t)\cdot\cos(n\cdot\omega\cdot t)\,\mathrm{d}t$$

$$b(n) := \frac{2}{T}\cdot\int_{t0}^{t0+T} x(t)\cdot\sin(n\cdot\omega\cdot t)\,\mathrm{d}t$$

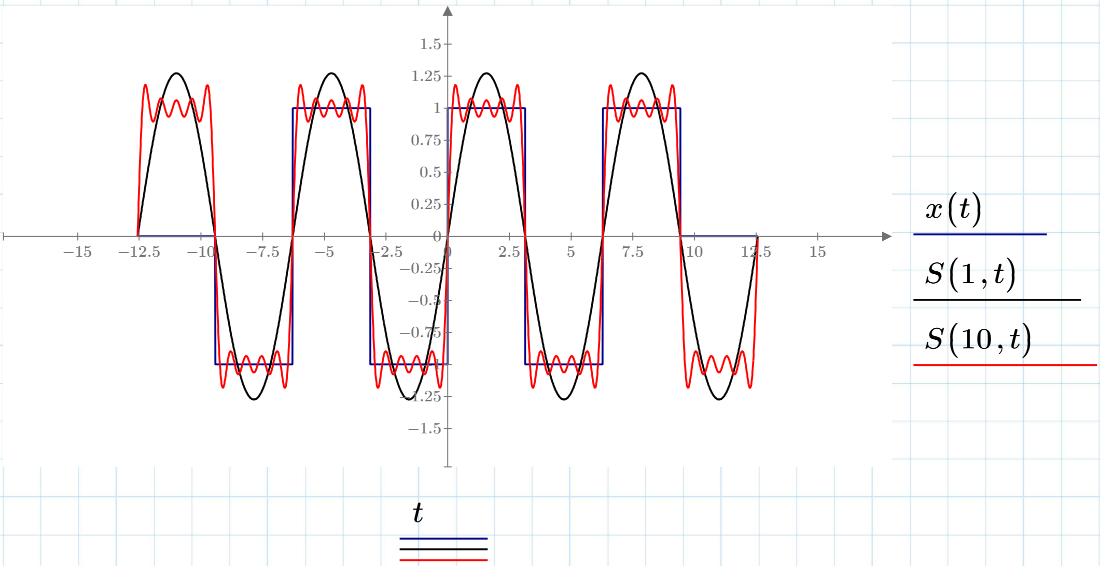
Valeur moyenne, fondamental, harmonique

$$H(n,t) := a(n) \cdot \cos(n \cdot \omega \cdot t) + b(n) \cdot \sin(n \cdot \omega \cdot t)$$




Série de Fourier de rang N

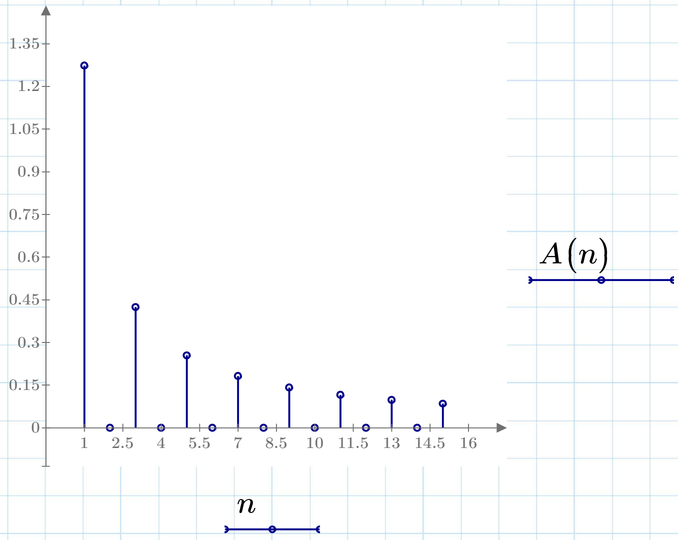
$$S(N,t) := a0 + \sum_{n=1}^{N} H(n,t)$$




Spectre d'amplitude de x

$$A(n) := \sqrt{a(n)^2 + b(n)^2}$$

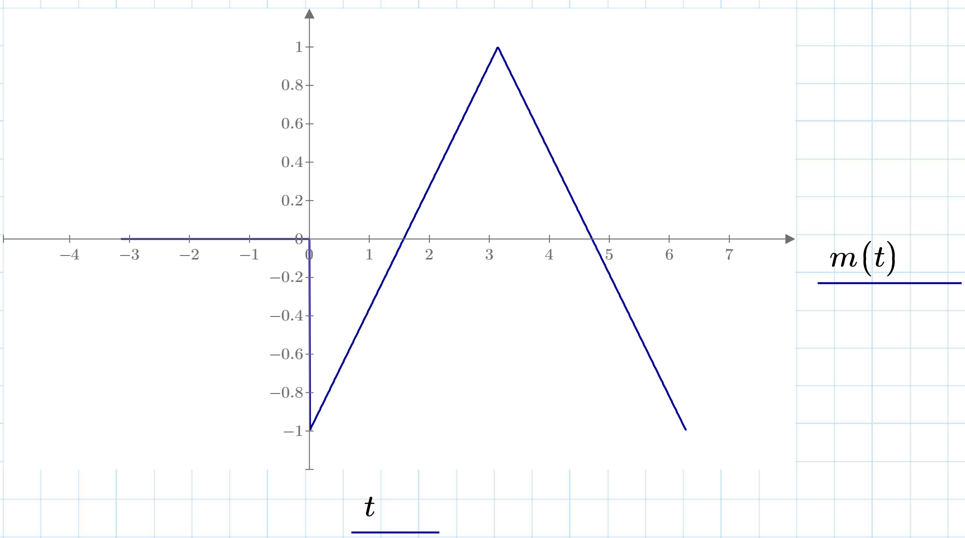
$$n := 1, 2..15$$



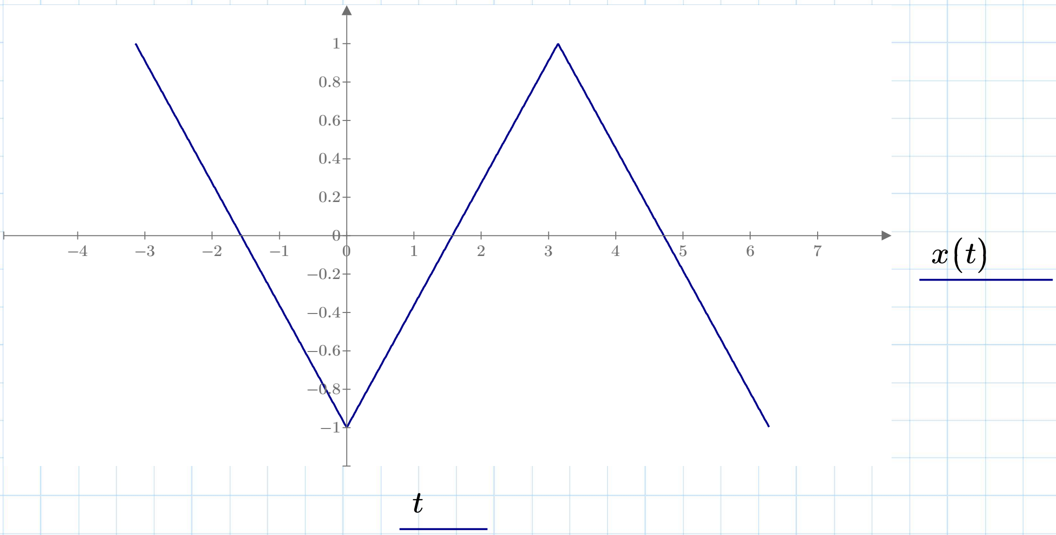

3) Autres séries de Fourier : page 14 a) Signal triangle

$$m(t) := \begin{cases} 0 & \text{if } t<0 \\ \frac{-2}{\pi}\cdot t+3 & \text{if } \pi \le t < 2\cdot\pi \\ \frac{2}{\pi}\cdot t-1 & \text{if } 0 \le t < \pi \\ 0 & \text{if } t \ge 2\cdot\pi \end{cases}$$

$$t := -\pi, -\pi+0.01 .. 2\cdot\pi$$



$$x(t) := m(t+2\cdot\pi) + m(t) + m(t-2\cdot\pi)$$




## Coefficients de Fourier de x

$$T := 2\cdot\pi \qquad \omega := 2\cdot\frac{\pi}{T} \qquad t0 := 0$$

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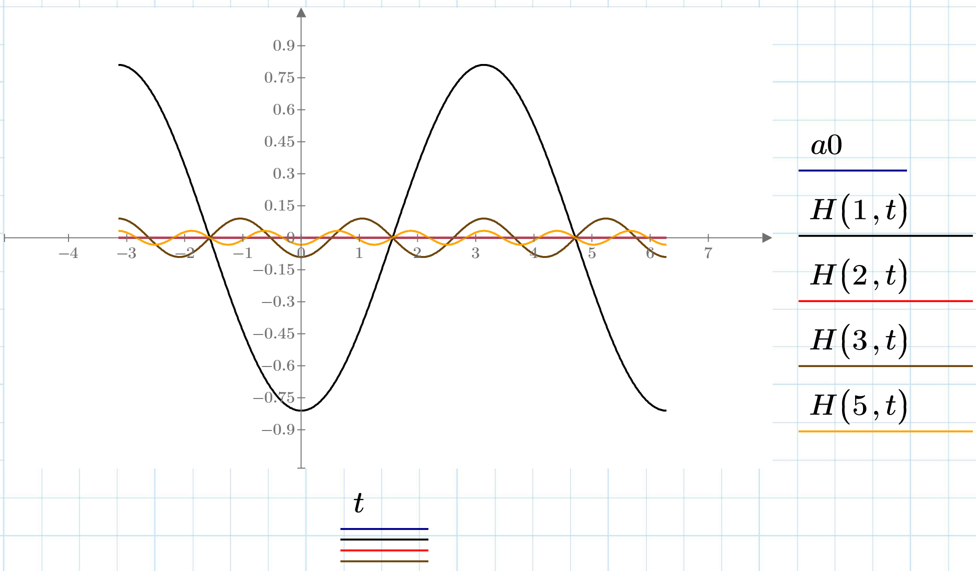
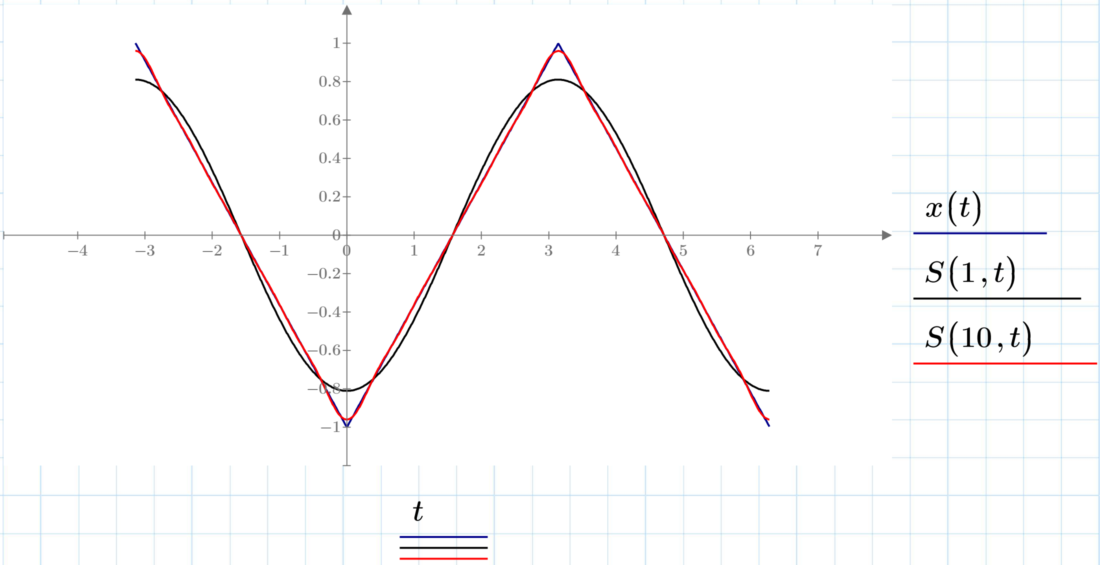
## Valeur moyenne, fondamental, harmonique

$$H(n,t) := a(n)\cdot\cos(n\cdot\omega\cdot t) + b(n)\cdot\sin(n\cdot\omega\cdot t)$$



Série de Fourier de rang N

$$S(N,t) := a0 + \sum_{n=1}^{N} H(n,t)$$




Spectre d'amplitude de x

$$A(n) := \sqrt{a(n)^2 + b(n)^2}$$

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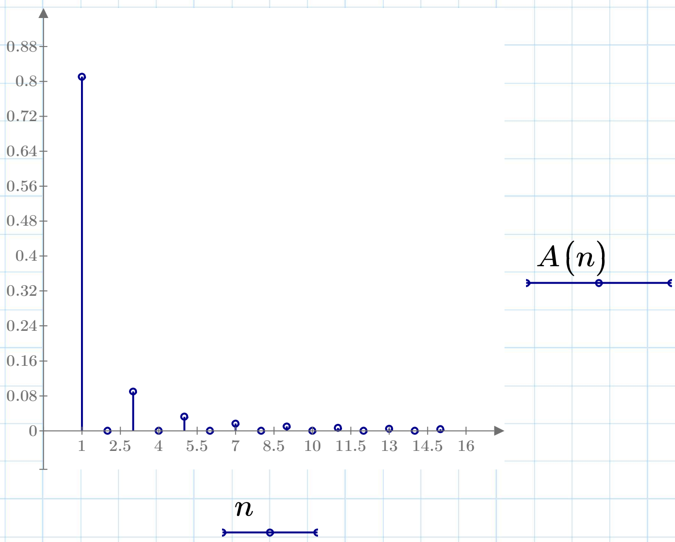
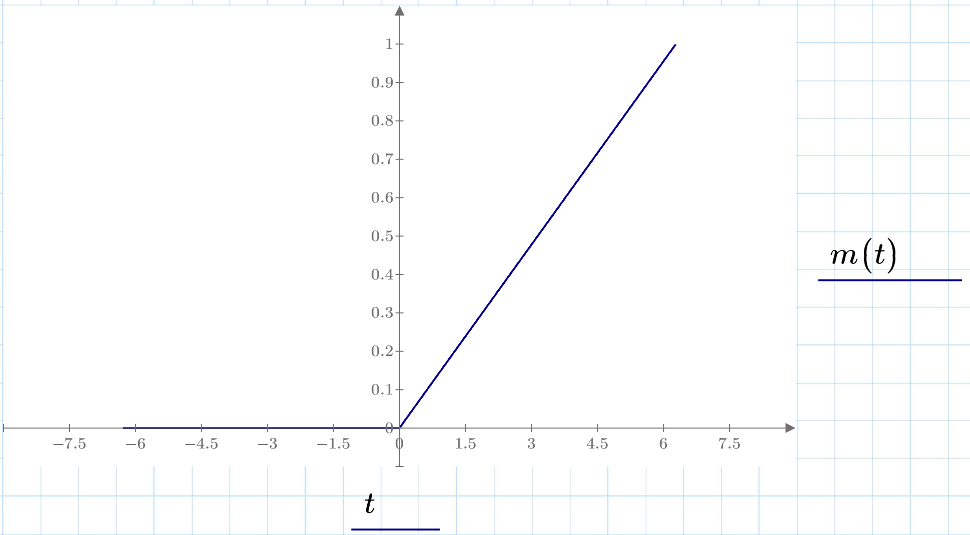


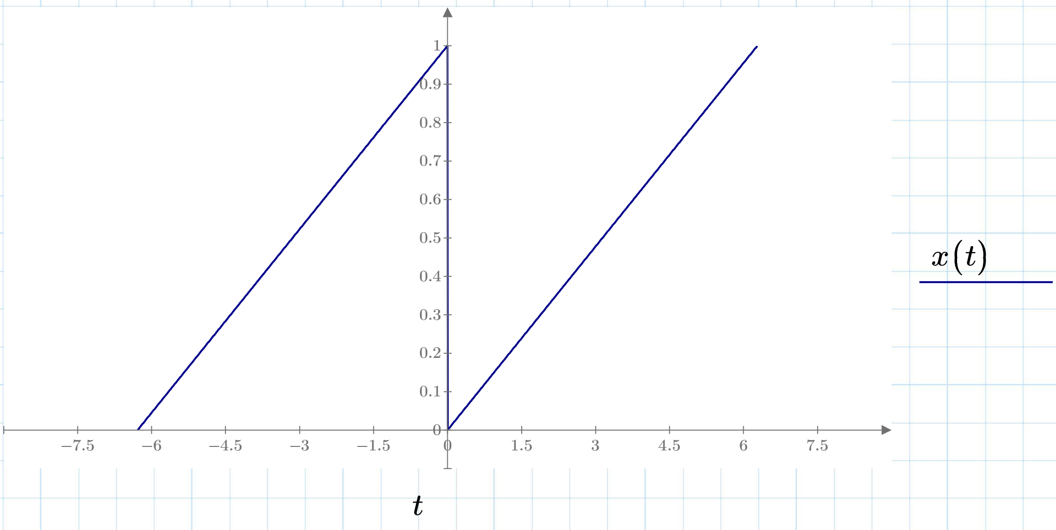
b) Signal en dents de scie

$$m(t) := \begin{cases} \frac{1}{2\cdot\pi}\cdot t & \text{if } 0 \le t < 2\cdot\pi \\ 0 & \text{else} \end{cases}$$

$$t := -2\cdot\pi, -2\cdot\pi + 0.01 .. 2\cdot\pi$$




$$x(t) := m(t + 2\cdot\pi) + m(t) + m(t - 2\cdot\pi)$$




Coefficients de Fourier de x

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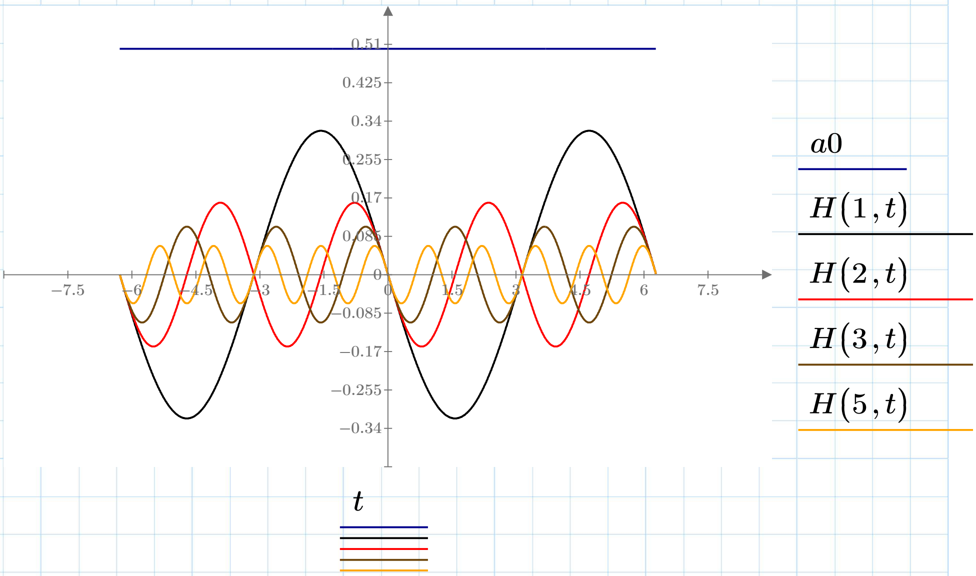
## Valeur moyenne, fondamental, harmonique

$$H(n,t) := a(n) \cdot \cos(n \cdot \omega \cdot t) + b(n) \cdot \sin(n \cdot \omega \cdot t)$$




## Série de Fourier de rang N

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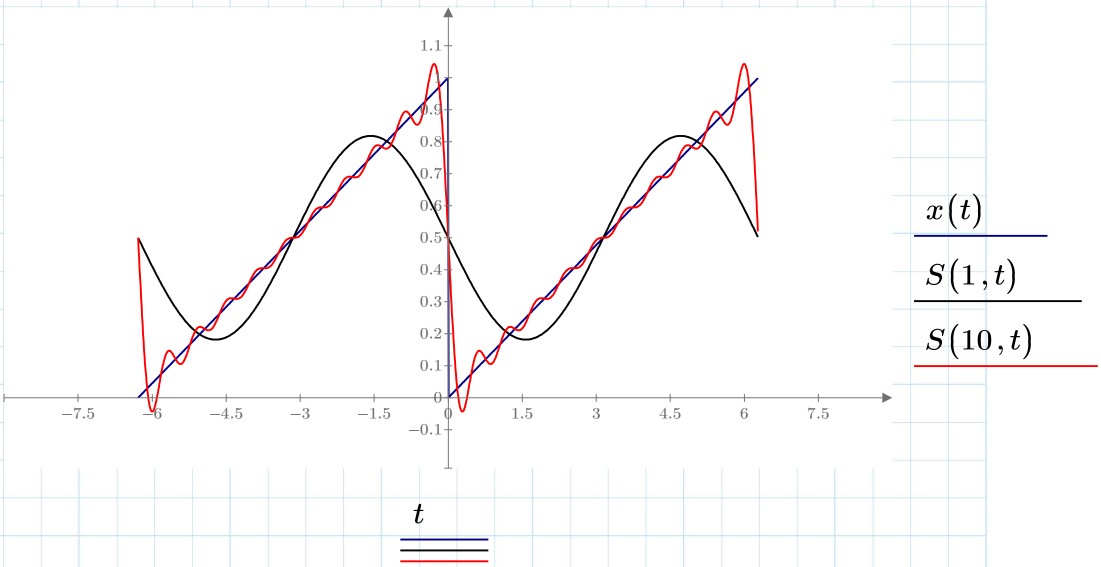

<u>Spectre d'amplitude de x</u>

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