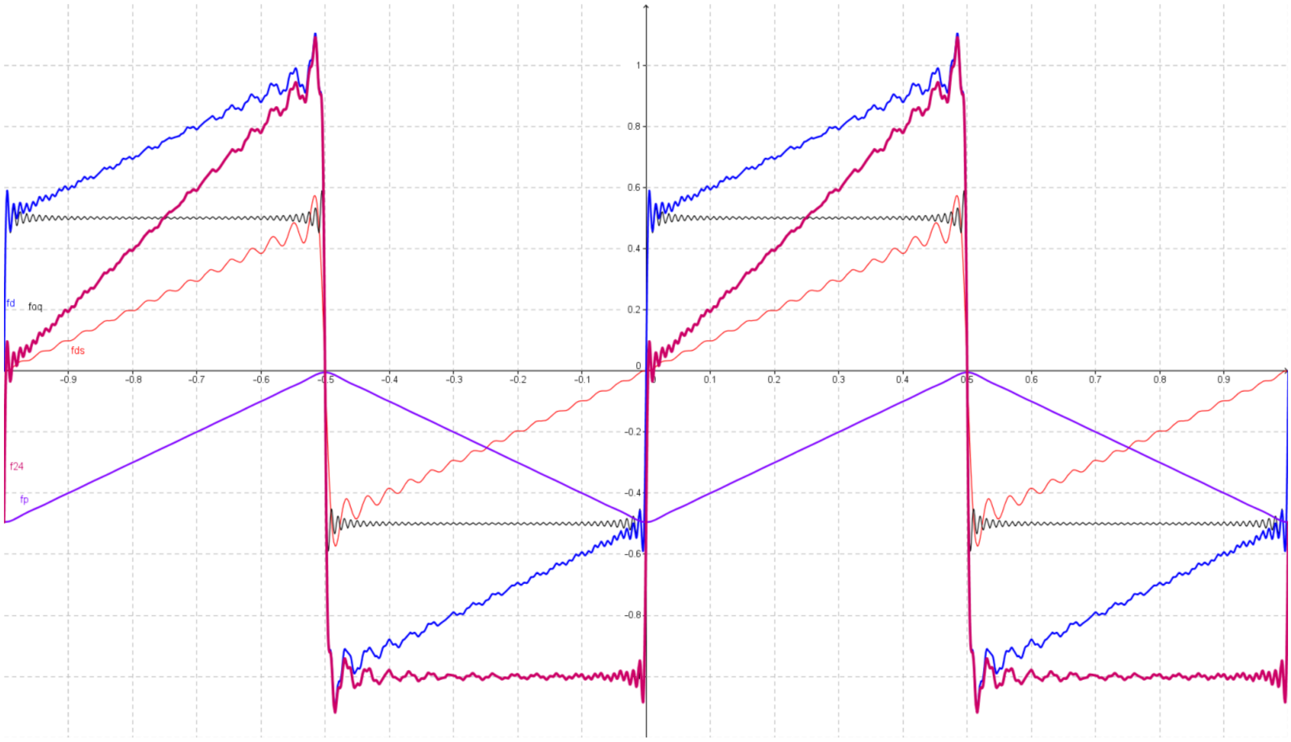


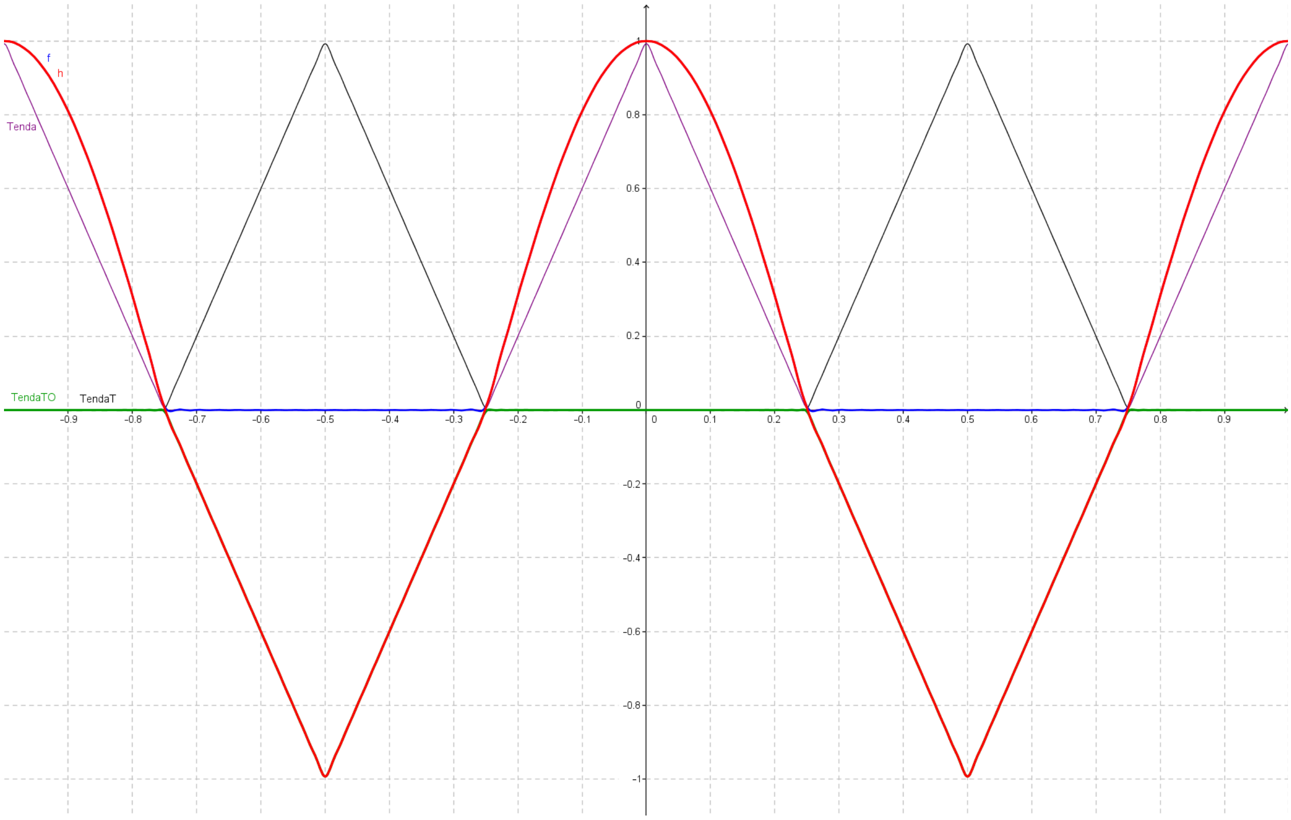

fp(x) = (-1) / 4 - 2 / $π^2$ (cos(2π x) + 1 / $3^2$ cos(3 (2) π x) + 1 / $5^2$ cos(5 (2) π x) + 1 / $7^2$ cos(7 (2) π x) + 1 / $9^2$ cos(9 (2) π x) + 1 / $11^2$ cos(11 (2) π x) + 1 / $13^2$ cos(13 (2) π x) + 1 / $15^2$ cos(15 (2) π x) + 1 / $17^2$ cos(17 (2) π x) + 1 / $19^2$ cos(19 (2) π x))foq(x) = 1 / π (sin(2π x) - 1 / 2 sin(2 (2) π x) + 1 / 3 sin(3 (2) π x) - 1 / 4 sin(4 (2) π x) + 1 / 5 sin(5 (2) π x) - 1 / 6 sin(6 (2) π x) + 1 / 7 sin(7 (2) π x) - 1 / 8 sin(8 (2) π x) + 1 / 9 sin(9 (2) π x) - 1 / 10 sin(10 (2) π x) + 1 / 11 sin(11 (2) π x) - 1 / 12 sin(12 (2) π x) + 1 / 13 sin(13 (2) π x) - 1 / 14 sin(14 (2) π x) + 1 / 15 sin(15 (2) π x) - 1 / 16 sin(16 (2) π x) + 1 / 17 sin(17 (2) π x) - 1 / 18 sin(18 (2) π x) + 1 / 19 sin(19 (2) π x) - 1 / 20 sin(20 (2) π x) + 1 / 21 sin(21 (2) π x) - 1 / 22 sin(22 (2) π x) + 1 / 23 sin(23 (2) π x) - 1 / 24 sin(24 (2) π x) + 1 / 25 sin(25 (2) π x) - 1 / 26 sin(26 (2) π x) + 1 / 27 sin(27 (2) π x) - 1 / 28 sin(28 (2) π x) + 1 / 29 sin(29 (2) π x) - 1 / 30 sin(30 (2) π x))

foq(x) = 2 / π (sin(2π x) + 1 / 3 sin(3 (2) π x) + 1 / 5 sin(5 (2) π x) + 1 / 7 sin(7 (2) π x) + 1 / 9 sin(9 (2) π x) + 1 / 11 sin(11 (2) π x) + 1 / 13 sin(13 (2) π x) + 1 / 15 sin(15 (2) π x) + 1 / 17 sin(17 (2) π x) + 1 / 19 sin(19 (2) π x) + 1 / 21 sin(21 (2) π x) + 1 / 23 sin(23 (2) π x) + 1 / 25 sin(25 (2) π x) + 1 / 27 sin(27 (2) π x) + 1 / 29 sin(29 (2) π x) + 1 / 31 sin(31 (2) π x) + 1 / 33 sin(33 (2) π x) + 1 / 35 sin(35 (2) π x) + 1 / 37 sin(37 (2) π x) + 1 / 39 sin(39 (2) π x) + 1 / 41 sin(41 (2) π x) + 1 / 43 sin(43 (2) π x) + 1 / 45 sin(45 (2) π x) + 1 / 47 sin(47 (2) π x) + 1 / 49 sin(49 (2) π x) + 1 / 51 sin(51 (2) π x) + 1 / 53 sin(53 (2) π x) + 1 / 55 sin(55 (2) π x) + 1 / 57 sin(57 (2) π x) + 1 / 59 sin(59 (2) π x) + 1 / 61 sin(61 (2) π x) + 1 / 63 sin(63 (2) π x) + 1 / 65 sin(65 (2) π x) + 1 / 67 sin(67 (2) π x) + 1 / 69 sin(69 (2) π x) + 1 / 71 sin(71 (2) π x) + 1 / 73 sin(73 (2) π x) + 1 / 75 sin(75 (2) π x) + 1 / 77 sin(77 (2) π x) + 1 / 79 sin(79 (2) π x) + 1 / 81 sin(81 (2) π x) + 1 / 83 sin(83 (2) π x) + 1 / 85 sin(85 (2) π x) + 1 / 87 sin(87 (2) π x) + 1 / 89 sin(89 (2) π x) + 1 / 91 sin(91 (2) π x) + 1 / 93 sin(93 (2) π x) + 1 / 95 sin(95 (2) π x) + 1 / 97 sin(97 (2) π x) + 1 / 99 sin(99 (2) π x))

fds(x) = 1 / π (sin(2π x) - 1 / 2 sin(2 (2) π x) + 1 / 3 sin(3 (2) π x) - 1 / 4 sin(4 (2) π x) + 1 / 5 sin(5 (2) π x) - 1 / 6 sin(6 (2) π x) + 1 / 7 sin(7 (2) π x) - 1 / 8 sin(8 (2) π x) + 1 / 9 sin(9 (2) π x) - 1 / 10 sin(10 (2) π x) + 1 / 11 sin(11 (2) π x) - 1 / 12 sin(12 (2) π x) + 1 / 13 sin(13 (2) π x) - 1 / 14 sin(14 (2) π x) + 1 / 15 sin(15 (2) π x) - 1 / 16 sin(16 (2) π x) + 1 / 17 sin(17 (2) π x) - 1 / 18 sin(18 (2) π x) + 1 / 19 sin(19 (2) π x) - 1 / 20 sin(20 (2) π x) + 1 / 21 sin(21 (2) π x) - 1 / 22 sin(22 (2) π x) + 1 / 23 sin(23 (2) π x) - 1 / 24 sin(24 (2) π x) + 1 / 25 sin(25 (2) π x) - 1 / 26 sin(26 (2) π x) + 1 / 27 sin(27 (2) π x) - 1 / 28 sin(28 (2) π x) + 1 / 29 sin(29 (2) π x) - 1 / 30 sin(30 (2) π x))

fd(x) = foq(x) + fds(x)

f24(x) = fp(x) + fd(x)

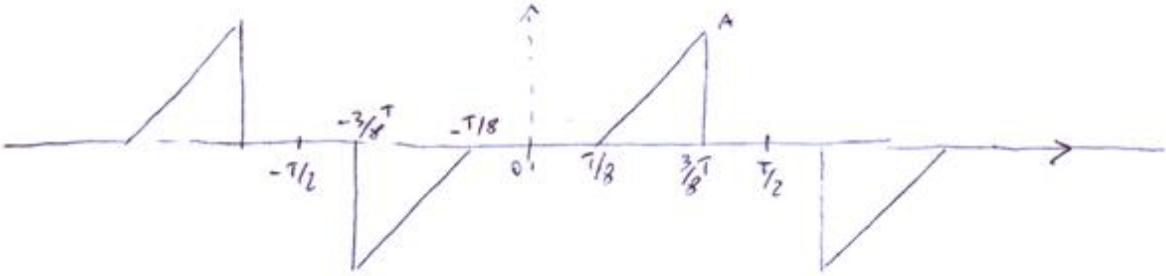



$$f(x) = 1 / \pi \, (1 + \pi / 2 \cos(2\pi x) + 2 / 3 \cos(2 (2) \pi x) - 2 / (3 (5)) \cos(4 (2) \pi x) + 2 / (5 (7)) \cos(6 (2) \pi x) - 2 / (7 (9)) \cos(8 (2) \pi x) + 2 / (9 (11)) \cos(10 (2) \pi x) - 2 / (11 (13)) \cos(12 (2) \pi x) + 2 / (13 (15)) \cos(14 (2) \pi x) - 2 / (15 (17)) \cos(16 (2) \pi x) + 2 / (17 (19)) \cos(18 (2) \pi x) - 2 / (19 (21)) \cos(20 (2) \pi x) + 2 / (21 (23)) \cos(22 (2) \pi x) - 2 / (23 (25)) \cos(24 (2) \pi x) + 2 / (25 (27)) \cos(26 (2) \pi x) - 2 / (27 (29)) \cos(28 (2) \pi x) + 2 / (29 (31)) \cos(30 (2) \pi x) - 2 / (31 (33)) \cos(32 (2) \pi x))$$

$$\mathrm{TendaT}(x) = 0.25 + 4 / \pi^2 \, (\cos(2\pi (x - 0.5)) + 2 / 2^2 \cos(2 (2) \pi (x - 0.5)) + 1 / 3^2 \cos(2 (3) \pi (x - 0.5)) + 0\cos(2 (4) \pi (x - 0.5)) + 1 / 5^2 \cos(2 (5) \pi (x - 0.5)) + 2 / 6^2 \cos(2 (6) \pi (x - 0.5)) + 1 / 7^2 \cos(2 (7) \pi (x - 0.5)) + 0\cos(2 (8) \pi (x - 0.5)) + 1 / 9^2 \cos(2 (9) \pi (x - 0.5)) + 2 / 10^2 \cos(2 (10) \pi (x - 0.5)) + 1 / 11^2 \cos(2 (11) \pi (x - 0.5)) + 0\cos(2 (12) \pi (x - 0.5)) + 1 / 13^2 \cos(2 (13) \pi (x - 0.5)) + 2 / 14^2 \cos(2 (14) \pi (x - 0.5)) + 1 / 15^2 \cos(2 (15) \pi (x - 0.5)) + 0\cos(2 (16) \pi (x - 0.5)) + 1 / 17^2 \cos(2 (17) \pi (x - 0.5)) + 2 / 18^2 \cos(2 (18) \pi (x - 0.5)) + 1 / 19^2 \cos(2 (19) \pi (x - 0.5)) + 0\cos(2 (20) \pi (x - 0.5)) + 1 / 21^2 \cos(2 (21) \pi (x - 0.5)) + 2 / 22^2 \cos(2 (22) \pi (x - 0.5)) + 1 / 23^2 \cos(2 (23) \pi (x - 0.5)) + 0\cos(2 (24) \pi (x - 0.5)) + 1 / 25^2 \cos(2 (25) \pi (x - 0.5)) + 2 / 26^2 \cos(2 (26) \pi (x - 0.5)) + 1 / 27^2 \cos(2 (27) \pi (x - 0.5)) + 0\cos(2 (28) \pi (x - 0.5)) + 1 / 29^2 \cos(2 (29) \pi (x - 0.5)) + 2 / 30^2 \cos(2 (30) \pi (x - 0.5)) + 1 / 31^2 \cos(2 (31) \pi (x - 0.5)) + 0\cos(2 (32) \pi (x - 0.5)) + 1 / 33^2 \cos(2 (33) \pi (x - 0.5)) + 2 / 34^2 \cos(2 (34) \pi (x - 0.5)) + 1 / 35^2 \cos(2 (35) \pi (x - 0.5)) + 0\cos(2 (36) \pi (x - 0.5)) + 1 / 37^2 \cos(2 (37) \pi (x - 0.5)) + 2 / 38^2 \cos(2 (38) \pi (x - 0.5)) + 1 / 39^2 \cos(2 (39) \pi (x - 0.5)) + 0\cos(2 (40) \pi (x - 0.5)) + 1 / 41^2 \cos(2 (41) \pi (x - 0.5)) + 2 / 42^2 \cos(2 (42) \pi (x - 0.5)) + 1 / 43^2 \cos(2 (43) \pi (x - 0.5)) + 0\cos(2 (44) \pi (x - 0.5)) + 1 / 45^2 \cos(2 (45) \pi (x - 0.5)) + 2 / 46^2 \cos(2 (46) \pi (x - 0.5)) + 1 / 47^2 \cos(2 (47) \pi (x - 0.5)) + 0\cos(2 (48) \pi (x - 0.5)) + 1 / 49^2 \cos(2 (49) \pi (x - 0.5)) + 2 / 50^2 \cos(2 (50) \pi (x - 0.5)) + 1 / 51^2 \cos(2 (51) \pi (x - 0.5)) + 0\cos(2 (52) \pi (x - 0.5)))$$

$$\mathrm{TendaTO}(x) = -\mathrm{TendaT}(x)$$

$$h(x) = f(x) + \mathrm{TendaTO}(x)$$




$$f(t) = \begin{cases} \frac{4A}{T}\left[t - \frac{T}{8}\right] = \frac{4A}{T}t - \frac{A}{2} & \frac{T}{8} < t < \frac{3}{8}T \\ \frac{4A}{T}\left[t + \frac{T}{8}\right] = \frac{4A}{T}t + \frac{A}{2} & -\frac{3}{8}T < t < -\frac{T}{8} \\ 0 & \text{altrove} \end{cases}$$

$A_0 = 0$

$a_m = 0$

$$b_m = \frac{2}{T}\int_T f(t)\sin m\omega t\,dt = \frac{4}{T}\int_{T/2} f(t)\sin m\omega t\,dt = \frac{4}{T}\int_{1/8\,T}^{\frac{3}{8}T}\left(\frac{4A}{T}t - \frac{A}{2}\right)\sin m\omega t\,dt =$$

$$= \frac{16A}{T^2}\int_{\frac{1}{8}T}^{\frac{3}{8}T} t\sin m\omega t\,dt - \frac{2A}{T}\int_{\frac{1}{8}T}^{\frac{3}{8}T}\sin m\omega t\,dt =$$

$$\int t\sin m\omega t\,dt = -t\frac{\cos m\omega t}{m\omega} + \frac{\sin m\omega t}{(m\omega)^2}$$

$$= \frac{16A}{T^2}\left[\left(-t\frac{\cos m\omega t}{m\omega} + \frac{\sin m\omega t}{(m\omega)^2}\right)\right]_{\frac{1}{8}T}^{\frac{3}{8}T} - \frac{2A}{T}\left(-\frac{\cos m\omega t}{m\omega}\right)\Bigg|_{\frac{1}{8}T}^{\frac{3}{8}T} =$$

$$= \frac{16A}{T^2}\left[-\frac{3}{8}T\frac{\cos m\omega\frac{3}{8}T}{m\omega} + \frac{\sin m\omega\frac{3}{8}T}{(m\omega)^2} + \frac{1}{8}T\frac{\cos m\omega T/8}{m\omega} - \frac{\sin m\omega T/8}{(m\omega)^2}\right] + \frac{2A}{T}\frac{\cos m\omega\frac{3}{8}T}{m\omega} - \frac{2A}{T}\frac{\cos m\omega T/8}{m\omega} =$$

$$\omega T = 2\pi$$
$$\omega\frac{3}{8}T = \frac{3}{8}2\pi = \frac{3}{4}\pi$$
$$\omega\frac{1}{8}T = \frac{1}{8}2\pi = \frac{1}{4}\pi$$

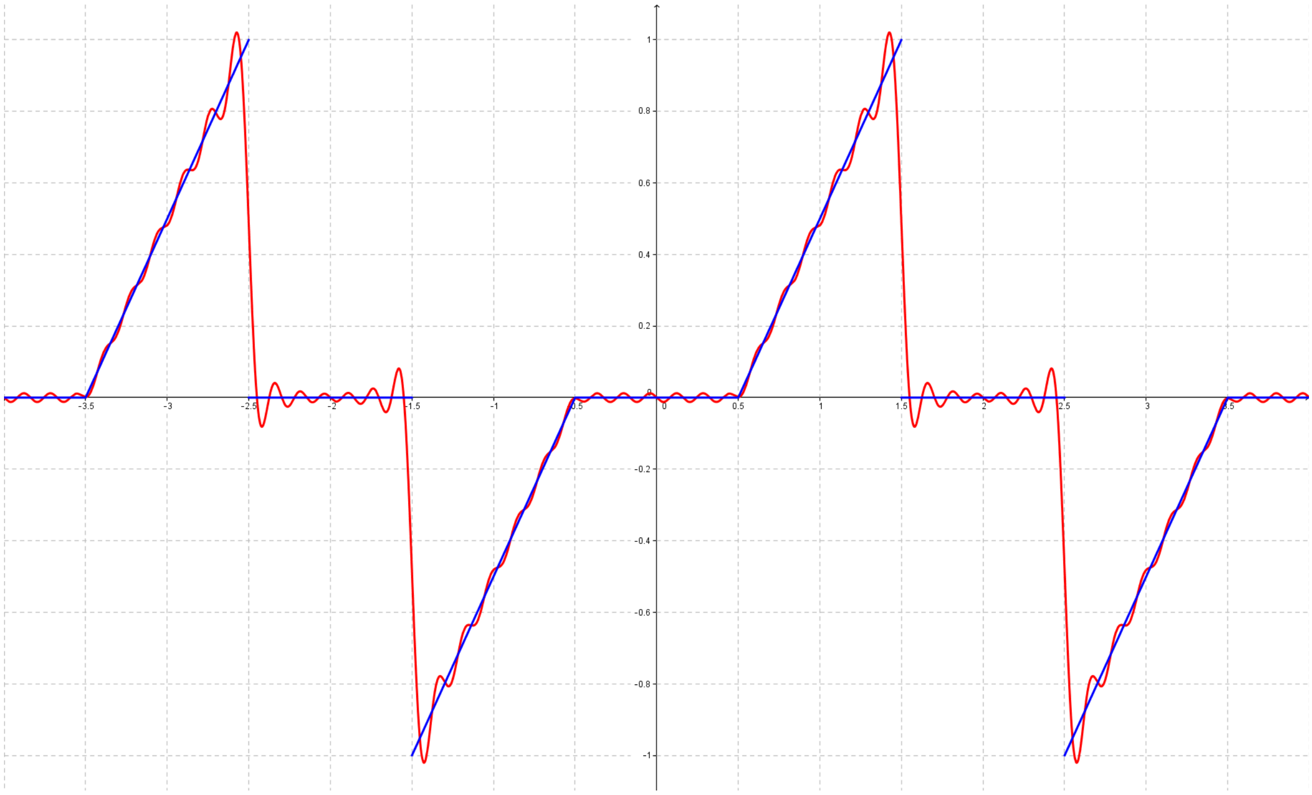
$$= -\frac{\cancel{16}^{2}A}{T^{\cancel{2}}}\cdot\frac{3\cancel{T}}{\cancel{8}_1}\frac{\cos m\frac{3}{4}\pi}{m\omega} + \frac{16A}{(m\omega T)^2}\sin m\frac{3}{4}\pi + \frac{16A}{T^2}\cdot\frac{T}{8}\frac{\cos m\pi/4}{m\omega} - \frac{16A}{(m\omega T)^2}\sin m\frac{\pi}{4} + \frac{2A}{m\omega T}\cos m\frac{3}{4}\pi - \frac{2A}{m\omega T}\cos m\frac{\pi}{4} =$$

$$= -\frac{\cancel{8}^{3}A}{m\cancel{2}\pi}\cos m\frac{3}{4}\pi + \frac{\cancel{16}^{4}A}{\cancel{4}m^2\pi^2}\sin m\frac{3}{4}\pi + \cancel{\frac{2A}{2m\pi}\cos m\frac{\pi}{4}} - \frac{16A}{m^2 4\pi^2}\sin m\frac{\pi}{4} + \frac{\cancel{2}A}{\cancel{2}m\pi}\cos m\frac{3}{4}\pi - \cancel{\frac{2A}{2m\pi}\cos m\frac{\pi}{4}}$$

$$= (-3+1)\frac{A}{m\pi}\cos m\frac{3}{4}\pi + \frac{4A}{m^2\pi^2}\left[\sin m\frac{3}{4}\pi - \sin m\frac{\pi}{4}\right] =$$

$$= -\frac{2A}{m\pi}\cos m\frac{3}{4}\pi + \frac{4A}{m^2\pi^2}\left[\sin m\frac{3}{4}\pi - \sin m\frac{\pi}{4}\right]$$

$$f(t) = \sum_{1}^{\infty}{}_m\, b_m\sin m\omega t \qquad \text{con } b_m = -\frac{2A}{m\pi}\cos m\frac{3}{4}\pi + \frac{4A}{m^2\pi^2}\left[\sin m\frac{3}{4}\pi - \sin m\frac{\pi}{4}\right]$$

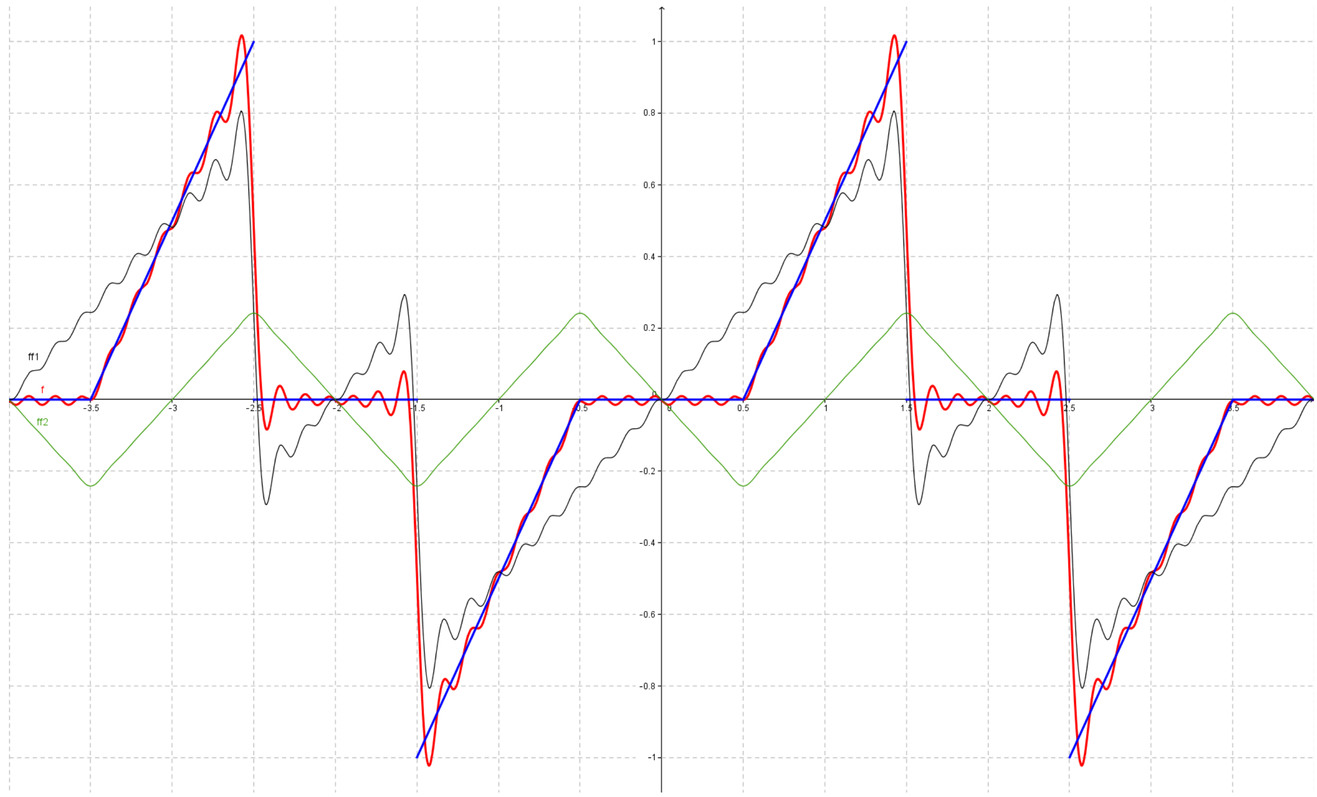


Con A=1

$b_n = -2 / (n \pi) \cos(n \pi 3 / 4) + 4 / (n \pi)^2 (\sin(n \pi 3 / 4) - \sin(n \pi / 4))$

con T=4

$$f(x) = (-2 / (1 \pi) \cos(1 \pi 3 / 4) + 4 / (1 \pi)^2 (\sin(1 \pi 3 / 4) - \sin(1 \pi / 4))) \sin(1 2\pi / 4 x)
+ (-2 / (2 \pi) \cos(2 \pi 3 / 4) + 4 / (2 \pi)^2 (\sin(2 \pi 3 / 4) - \sin(2 \pi / 4))) \sin(2 2\pi / 4 x)
+ (-2 / (3 \pi) \cos(3 \pi 3 / 4) + 4 / (3 \pi)^2 (\sin(3 \pi 3 / 4) - \sin(3 \pi / 4))) \sin(3 2\pi / 4 x)
+ (-2 / (4 \pi) \cos(4 \pi 3 / 4) + 4 / (4 \pi)^2 (\sin(4 \pi 3 / 4) - \sin(4 \pi / 4))) \sin(4 2\pi / 4 x)
+ (-2 / (5 \pi) \cos(5 \pi 3 / 4) + 4 / (5 \pi)^2 (\sin(5 \pi 3 / 4) - \sin(5 \pi / 4))) \sin(5 2\pi / 4 x)
+ (-2 / (6 \pi) \cos(6 \pi 3 / 4) + 4 / (6 \pi)^2 (\sin(6 \pi 3 / 4) - \sin(6 \pi / 4))) \sin(6 2\pi / 4 x)
+ (-2 / (7 \pi) \cos(7 \pi 3 / 4) + 4 / (7 \pi)^2 (\sin(7 \pi 3 / 4) - \sin(7 \pi / 4))) \sin(7 2\pi / 4 x)
+ (-2 / (8 \pi) \cos(8 \pi 3 / 4) + 4 / (8 \pi)^2 (\sin(8 \pi 3 / 4) - \sin(8 \pi / 4))) \sin(8 2\pi / 4 x)
+ (-2 / (9 \pi) \cos(9 \pi 3 / 4) + 4 / (9 \pi)^2 (\sin(9 \pi 3 / 4) - \sin(9 \pi / 4))) \sin(9 2\pi / 4 x)
+ (-2 / (10 \pi) \cos(10 \pi 3 / 4) + 4 / (10 \pi)^2 (\sin(10 \pi 3 / 4) - \sin(10 \pi / 4))) \sin(10 2\pi / 4 x)
+ (-2 / (11 \pi) \cos(11 \pi 3 / 4) + 4 / (11 \pi)^2 (\sin(11 \pi 3 / 4) - \sin(11 \pi / 4))) \sin(11 2\pi / 4 x)
+ (-2 / (12 \pi) \cos(12 \pi 3 / 4) + 4 / (12 \pi)^2 (\sin(12 \pi 3 / 4) - \sin(12 \pi / 4))) \sin(12 2\pi / 4 x)
+ (-2 / (13 \pi) \cos(13 \pi 3 / 4) + 4 / (13 \pi)^2 (\sin(13 \pi 3 / 4) - \sin(13 \pi / 4))) \sin(13 2\pi / 4 x)
+ (-2 / (14 \pi) \cos(14 \pi 3 / 4) + 4 / (14 \pi)^2 (\sin(14 \pi 3 / 4) - \sin(14 \pi / 4))) \sin(14 2\pi / 4 x)
+ (-2 / (15 \pi) \cos(15 \pi 3 / 4) + 4 / (15 \pi)^2 (\sin(15 \pi 3 / 4) - \sin(15 \pi / 4))) \sin(15 2\pi / 4 x)
+ (-2 / (16 \pi) \cos(16 \pi 3 / 4) + 4 / (16 \pi)^2 (\sin(16 \pi 3 / 4) - \sin(16 \pi / 4))) \sin(16 2\pi / 4 x)
+ (-2 / (17 \pi) \cos(17 \pi 3 / 4) + 4 / (17 \pi)^2 (\sin(17 \pi 3 / 4) - \sin(17 \pi / 4))) \sin(17 2\pi / 4 x)
+ (-2 / (18 \pi) \cos(18 \pi 3 / 4) + 4 / (18 \pi)^2 (\sin(18 \pi 3 / 4) - \sin(18 \pi / 4))) \sin(18 2\pi / 4 x)
+ (-2 / (19 \pi) \cos(19 \pi 3 / 4) + 4 / (19 \pi)^2 (\sin(19 \pi 3 / 4) - \sin(19 \pi / 4))) \sin(19 2\pi / 4 x)
+ (-2 / (20 \pi) \cos(20 \pi 3 / 4) + 4 / (20 \pi)^2 (\sin(20 \pi 3 / 4) - \sin(20 \pi / 4))) \sin(20 2\pi / 4 x)
+ (-2 / (21 \pi) \cos(21 \pi 3 / 4) + 4 / (21 \pi)^2 (\sin(21 \pi 3 / 4) - \sin(21 \pi / 4))) \sin(21 2\pi / 4 x)
+ (-2 / (22 \pi) \cos(22 \pi 3 / 4) + 4 / (22 \pi)^2 (\sin(22 \pi 3 / 4) - \sin(22 \pi / 4))) \sin(22 2\pi / 4 x)
+ (-2 / (23 \pi) \cos(23 \pi 3 / 4) + 4 / (23 \pi)^2 (\sin(23 \pi 3 / 4) - \sin(23 \pi / 4))) \sin(23 2\pi / 4 x)
+ (-2 / (24 \pi) \cos(24 \pi 3 / 4) + 4 / (24 \pi)^2 (\sin(24 \pi 3 / 4) - \sin(24 \pi / 4))) \sin(24 2\pi / 4 x)$$




$f(x) = ff1(x) + ff2(x)$

$b_n = -2 / (n \pi) \cos(n \pi\, 3 / 4) + 4\, 0 / (n \pi)^2 (\sin(n \pi\, 3 / 4) - \sin(n \pi / 4))$

$$
\begin{aligned}
ff1(x) = {} & (-2 / (1 \pi) \cos(1 \pi\, 3 / 4) + 4\, 0/ (1 \pi)^2 (\sin(1 \pi\, 3 / 4) - \sin(1 \pi / 4))) \sin(1\, 2\pi / 4\, x) \\
& + (-2 / (2 \pi) \cos(2 \pi\, 3 / 4) + 4\, 0/ (2 \pi)^2 (\sin(2 \pi\, 3 / 4) - \sin(2 \pi / 4))) \sin(2\, 2\pi / 4\, x) \\
& + (-2 / (3 \pi) \cos(3 \pi\, 3 / 4) + 4\, 0/ (3 \pi)^2 (\sin(3 \pi\, 3 / 4) - \sin(3 \pi / 4))) \sin(3\, 2\pi / 4\, x) \\
& + (-2 / (4 \pi) \cos(4 \pi\, 3 / 4) + 4\, 0/ (4 \pi)^2 (\sin(4 \pi\, 3 / 4) - \sin(4 \pi / 4))) \sin(4\, 2\pi / 4\, x) \\
& + (-2 / (5 \pi) \cos(5 \pi\, 3 / 4) + 4\, 0/ (5 \pi)^2 (\sin(5 \pi\, 3 / 4) - \sin(5 \pi / 4))) \sin(5\, 2\pi / 4\, x) \\
& + (-2 / (6 \pi) \cos(6 \pi\, 3 / 4) + 4\, 0/ (6 \pi)^2 (\sin(6 \pi\, 3 / 4) - \sin(6 \pi / 4))) \sin(6\, 2\pi / 4\, x) \\
& + (-2 / (7 \pi) \cos(7 \pi\, 3 / 4) + 4\, 0/ (7 \pi)^2 (\sin(7 \pi\, 3 / 4) - \sin(7 \pi / 4))) \sin(7\, 2\pi / 4\, x) \\
& + (-2 / (8 \pi) \cos(8 \pi\, 3 / 4) + 4\, 0/ (8 \pi)^2 (\sin(8 \pi\, 3 / 4) - \sin(8 \pi / 4))) \sin(8\, 2\pi / 4\, x) \\
& + (-2 / (9 \pi) \cos(9 \pi\, 3 / 4) + 4\, 0/ (9 \pi)^2 (\sin(9 \pi\, 3 / 4) - \sin(9 \pi / 4))) \sin(9\, 2\pi / 4\, x) \\
& + (-2 / (10 \pi) \cos(10 \pi\, 3 / 4) + 4\, 0/ (10 \pi)^2 (\sin(10 \pi\, 3 / 4) - \sin(10 \pi / 4))) \sin(10\, 2\pi / 4\, x) \\
& + (-2 / (11 \pi) \cos(11 \pi\, 3 / 4) + 4\, 0/ (11 \pi)^2 (\sin(11 \pi\, 3 / 4) - \sin(11 \pi / 4))) \sin(11\, 2\pi / 4\, x) \\
& + (-2 / (12 \pi) \cos(12 \pi\, 3 / 4) + 4\, 0/ (12 \pi)^2 (\sin(12 \pi\, 3 / 4) - \sin(12 \pi / 4))) \sin(12\, 2\pi / 4\, x) \\
& + (-2 / (13 \pi) \cos(13 \pi\, 3 / 4) + 4\, 0/ (13 \pi)^2 (\sin(13 \pi\, 3 / 4) - \sin(13 \pi / 4))) \sin(13\, 2\pi / 4\, x) \\
& + (-2 / (14 \pi) \cos(14 \pi\, 3 / 4) + 4\, 0/ (14 \pi)^2 (\sin(14 \pi\, 3 / 4) - \sin(14 \pi / 4))) \sin(14\, 2\pi / 4\, x) \\
& + (-2 / (15 \pi) \cos(15 \pi\, 3 / 4) + 4\, 0/ (15 \pi)^2 (\sin(15 \pi\, 3 / 4) - \sin(15 \pi / 4))) \sin(15\, 2\pi / 4\, x) \\
& + (-2 / (16 \pi) \cos(16 \pi\, 3 / 4) + 4\, 0/ (16 \pi)^2 (\sin(16 \pi\, 3 / 4) - \sin(16 \pi / 4))) \sin(16\, 2\pi / 4\, x) \\
& + (-2 / (17 \pi) \cos(17 \pi\, 3 / 4) + 4\, 0/ (17 \pi)^2 (\sin(17 \pi\, 3 / 4) - \sin(17 \pi / 4))) \sin(17\, 2\pi / 4\, x) \\
& + (-2 / (18 \pi) \cos(18 \pi\, 3 / 4) + 4\, 0/ (18 \pi)^2 (\sin(18 \pi\, 3 / 4) - \sin(18 \pi / 4))) \sin(18\, 2\pi / 4\, x) \\
& + (-2 / (19 \pi) \cos(19 \pi\, 3 / 4) + 4\, 0/ (19 \pi)^2 (\sin(19 \pi\, 3 / 4) - \sin(19 \pi / 4))) \sin(19\, 2\pi / 4\, x) \\
& + (-2 / (20 \pi) \cos(20 \pi\, 3 / 4) + 4\, 0/ (20 \pi)^2 (\sin(20 \pi\, 3 / 4) - \sin(20 \pi / 4))) \sin(20\, 2\pi / 4\, x) \\
& + (-2 / (21 \pi) \cos(21 \pi\, 3 / 4) + 4\, 0/ (21 \pi)^2 (\sin(21 \pi\, 3 / 4) - \sin(21 \pi / 4))) \sin(21\, 2\pi / 4\, x) \\
& + (-2 / (22 \pi) \cos(22 \pi\, 3 / 4) + 4\, 0/ (22 \pi)^2 (\sin(22 \pi\, 3 / 4) - \sin(22 \pi / 4))) \sin(22\, 2\pi / 4\, x) \\
& + (-2 / (23 \pi) \cos(23 \pi\, 3 / 4) + 4\, 0/ (23 \pi)^2 (\sin(23 \pi\, 3 / 4) - \sin(23 \pi / 4))) \sin(23\, 2\pi / 4\, x) \\
& + (-2 / (24 \pi) \cos(24 \pi\, 3 / 4) + 4\, 0/ (24 \pi)^2 (\sin(24 \pi\, 3 / 4) - \sin(24 \pi / 4))) \sin(24\, 2\pi / 4\, x)
\end{aligned}
$$

$b_n$ = -2 0/ (n π) cos(n π 3 / 4) + 4 / (n π)$^2$ (sin(n π 3 / 4) - sin(n π / 4))

ff2(x) = (-2 0/ (1 π) cos(1 π 3 / 4) + 4 / (1 π)$^2$ (sin(1 π 3 / 4) - sin(1 π / 4))) sin(1 2π / 4 x) + (-2 0/ (2 π) cos(2 π 3 / 4) + 4 / (2 π)$^2$ (sin(2 π 3 / 4) - sin(2 π / 4))) sin(2 2π / 4 x) + (-2 0/ (3 π) cos(3 π 3 / 4) + 4 / (3 π)$^2$ (sin(3 π 3 / 4) - sin(3 π / 4))) sin(3 2π / 4 x) + (-2 0/ (4 π) cos(4 π 3 / 4) + 4 / (4 π)$^2$ (sin(4 π 3 / 4) - sin(4 π / 4))) sin(4 2π / 4 x) + (-2 0/ (5 π) cos(5 π 3 / 4) + 4 / (5 π)$^2$ (sin(5 π 3 / 4) - sin(5 π / 4))) sin(5 2π / 4 x) + (-2 0/ (6 π) cos(6 π 3 / 4) + 4 / (6 π)$^2$ (sin(6 π 3 / 4) - sin(6 π / 4))) sin(6 2π / 4 x) + (-2 0/ (7 π) cos(7 π 3 / 4) + 4 / (7 π)$^2$ (sin(7 π 3 / 4) - sin(7 π / 4))) sin(7 2π / 4 x) + (-2 0/ (8 π) cos(8 π 3 / 4) + 4 / (8 π)$^2$ (sin(8 π 3 / 4) - sin(8 π / 4))) sin(8 2π / 4 x) + (-2 0/ (9 π) cos(9 π 3 / 4) + 4 / (9 π)$^2$ (sin(9 π 3 / 4) - sin(9 π / 4))) sin(9 2π / 4 x) + (-2 0/ (10 π) cos(10 π 3 / 4) + 4 / (10 π)$^2$ (sin(10 π 3 / 4) - sin(10 π / 4))) sin(10 2π / 4 x) + (-2 0/ (11 π) cos(11 π 3 / 4) + 4 / (11 π)$^2$ (sin(11 π 3 / 4) - sin(11 π / 4))) sin(11 2π / 4 x) + (-2 0/ (12 π) cos(12 π 3 / 4) + 4 / (12 π)$^2$ (sin(12 π 3 / 4) - sin(12 π / 4))) sin(12 2π / 4 x) + (-2 0/ (13 π) cos(13 π 3 / 4) + 4 / (13 π)$^2$ (sin(13 π 3 / 4) - sin(13 π / 4))) sin(13 2π / 4 x) + (-2 0/ (14 π) cos(14 π 3 / 4) + 4 / (14 π)$^2$ (sin(14 π 3 / 4) - sin(14 π / 4))) sin(14 2π / 4 x) + (-2 0/ (15 π) cos(15 π 3 / 4) + 4 / (15 π)$^2$ (sin(15 π 3 / 4) - sin(15 π / 4))) sin(15 2π / 4 x) + (-2 0/ (16 π) cos(16 π 3 / 4) + 4 / (16 π)$^2$ (sin(16 π 3 / 4) - sin(16 π / 4))) sin(16 2π / 4 x) + (-2 0/ (17 π) cos(17 π 3 / 4) + 4 / (17 π)$^2$ (sin(17 π 3 / 4) - sin(17 π / 4))) sin(17 2π / 4 x) + (-2 0/ (18 π) cos(18 π 3 / 4) + 4 / (18 π)$^2$ (sin(18 π 3 / 4) - sin(18 π / 4))) sin(18 2π / 4 x) + (-2 0/ (19 π) cos(19 π 3 / 4) + 4 / (19 π)$^2$ (sin(19 π 3 / 4) - sin(19 π / 4))) sin(19 2π / 4 x) + (-2 0/ (20 π) cos(20 π 3 / 4) + 4 / (20 π)$^2$ (sin(20 π 3 / 4) - sin(20 π / 4))) sin(20 2π / 4 x) + (-2 0/ (21 π) cos(21 π 3 / 4) + 4 / (21 π)$^2$ (sin(21 π 3 / 4) - sin(21 π / 4))) sin(21 2π / 4 x) + (-2 0/ (22 π) cos(22 π 3 / 4) + 4 / (22 π)$^2$ (sin(22 π 3 / 4) - sin(22 π / 4))) sin(22 2π / 4 x) + (-2 0/ (23 π) cos(23 π 3 / 4) + 4 / (23 π)$^2$ (sin(23 π 3 / 4) - sin(23 π / 4))) sin(23 2π / 4 x) + (-2 0/ (24 π) cos(24 π 3 / 4) + 4 / (24 π)$^2$ (sin(24 π 3 / 4) - sin(24 π / 4))) sin(24 2π / 4 x)

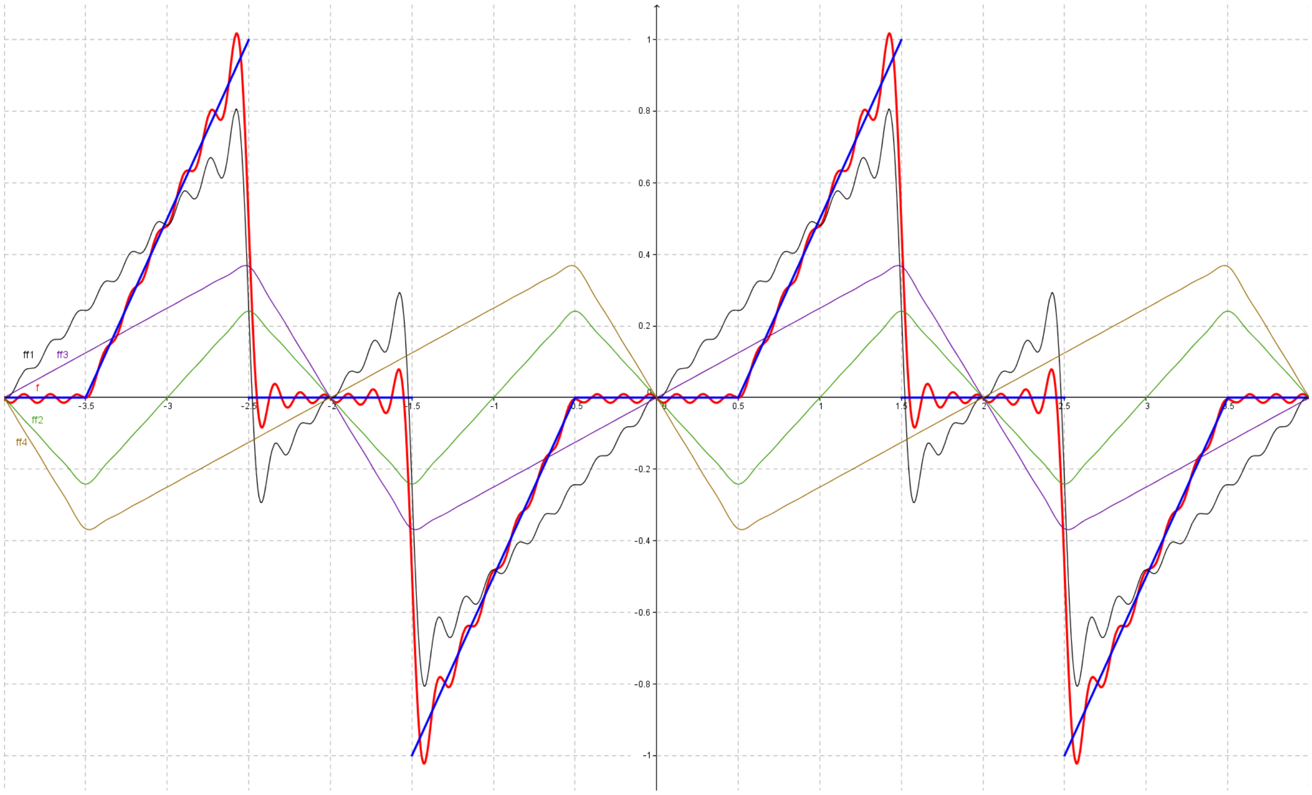
ff2(x) = ff3(x) + ff4(x)

$b_n$ = -2 0/ (n π) cos(n π 3 / 4) + 4 / (n π)$^2$ (sin(n π 3 / 4) - 0sin(n π / 4))

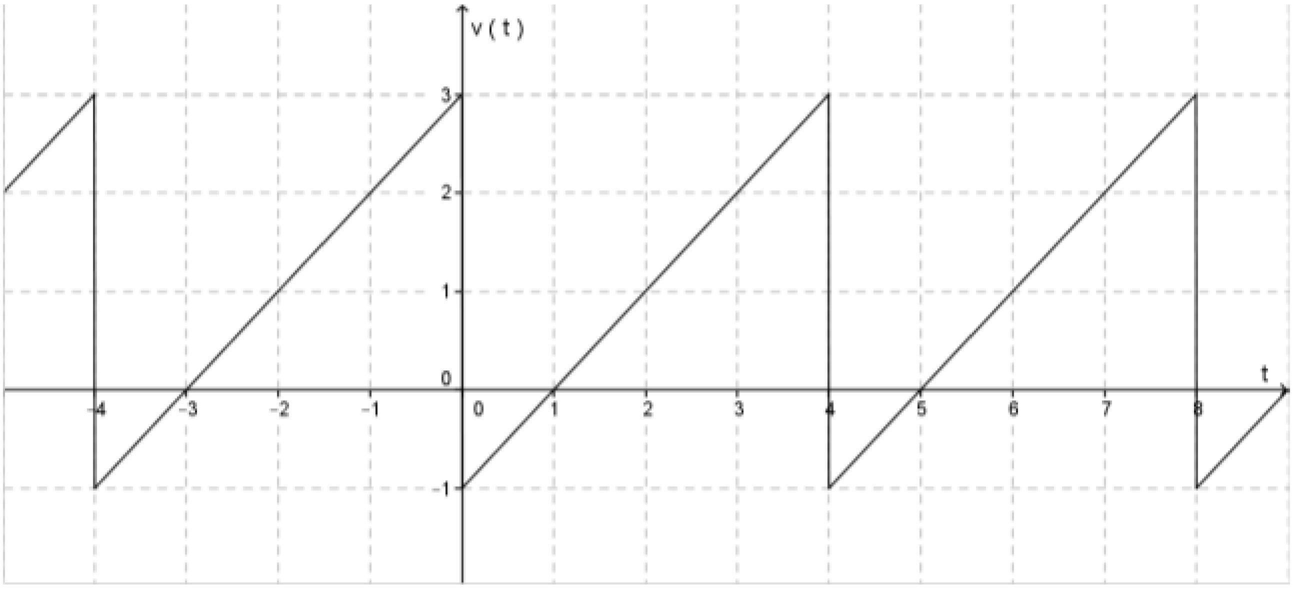
ff3(x) = (-2 0/ (1 π) cos(1 π 3 / 4) + 4 / (1 π)$^2$ (sin(1 π 3 / 4) - 0sin(1 π / 4))) sin(1 2π / 4 x) + (-2 0/ (2 π) cos(2 π 3 / 4) + 4 / (2 π)$^2$ (sin(2 π 3 / 4) - 0sin(2 π / 4))) sin(2 2π / 4 x) + (-2 0/ (3 π) cos(3 π 3 / 4) + 4 / (3 π)$^2$ (sin(3 π 3 / 4) - 0sin(3 π / 4))) sin(3 2π / 4 x) + (-2 0/ (4 π) cos(4 π 3 / 4) + 4 / (4 π)$^2$ (sin(4 π 3 / 4) - 0sin(4 π / 4))) sin(4 2π / 4 x) + (-2 0/ (5 π) cos(5 π 3 / 4) + 4 / (5 π)$^2$ (sin(5 π 3 / 4) - 0sin(5 π / 4))) sin(5 2π / 4 x) + (-2 0/ (6 π) cos(6 π 3 / 4) + 4 / (6 π)$^2$ (sin(6 π 3 / 4) - 0sin(6 π / 4))) sin(6 2π / 4 x) + (-2 0/ (7 π) cos(7 π 3 / 4) + 4 / (7 π)$^2$ (sin(7 π 3 / 4) - 0sin(7 π / 4))) sin(7 2π / 4 x) + (-2 0/ (8 π) cos(8 π 3 / 4) + 4 / (8 π)$^2$ (sin(8 π 3 / 4) - 0sin(8 π / 4))) sin(8 2π / 4 x) + (-2 0/ (9 π) cos(9 π 3 / 4) + 4 / (9 π)$^2$ (sin(9 π 3 / 4) - 0sin(9 π / 4))) sin(9 2π / 4 x) + (-2 0/ (10 π) cos(10 π 3 / 4) + 4 / (10 π)$^2$ (sin(10 π 3 / 4) - 0sin(10 π / 4))) sin(10 2π / 4 x) + (-2 0/ (11 π) cos(11 π 3 / 4) + 4 / (11 π)$^2$ (sin(11 π 3 / 4) - 0sin(11 π / 4))) sin(11 2π / 4 x) + (-2 0/ (12 π) cos(12 π 3 / 4) + 4 / (12 π)$^2$ (sin(12 π 3 / 4) - 0sin(12 π / 4))) sin(12 2π / 4 x) + (-2 0/ (13 π) cos(13 π 3 / 4) + 4 / (13 π)$^2$ (sin(13 π 3 / 4) - 0sin(13 π / 4))) sin(13 2π / 4 x) + (-2 0/ (14 π) cos(14 π 3 / 4) + 4 / (14 π)$^2$ (sin(14 π 3 / 4) - 0sin(14 π / 4))) sin(14 2π / 4 x) + (-2 0/ (15 π) cos(15 π 3 / 4) + 4 / (15 π)$^2$ (sin(15 π 3 / 4) - 0sin(15 π / 4))) sin(15 2π / 4 x) + (-2 0/ (16 π) cos(16 π 3 / 4) + 4 / (16 π)$^2$ (sin(16 π 3 / 4) - 0sin(16 π / 4))) sin(16 2π / 4 x) + (-2 0/ (17 π) cos(17 π 3 / 4) + 4 / (17 π)$^2$ (sin(17 π 3 / 4) - 0sin(17 π / 4))) sin(17 2π / 4 x) + (-2 0/ (18 π) cos(18 π 3 / 4) + 4 / (18 π)$^2$ (sin(18 π 3 / 4) - 0sin(18 π / 4))) sin(18 2π / 4 x) + (-2 0/ (19 π) cos(19 π 3 / 4) + 4 / (19 π)$^2$ (sin(19 π 3 / 4) - 0sin(19 π / 4))) sin(19 2π / 4 x) + (-2 0/ (20 π) cos(20 π 3 / 4) + 4 / (20 π)$^2$ (sin(20 π 3 / 4) - 0sin(20 π / 4))) sin(20 2π / 4 x) + (-2 0/ (21 π) cos(21 π 3 / 4) + 4 / (21 π)$^2$ (sin(21 π 3 / 4) - 0sin(21 π / 4))) sin(21 2π / 4 x) + (-2 0/ (22 π) cos(22 π 3 / 4) + 4 / (22 π)$^2$ (sin(22 π 3 / 4) - 0sin(22 π / 4))) sin(22 2π / 4 x) + (-2 0/ (23 π) cos(23 π 3 / 4) + 4 / (23 π)$^2$ (sin(23 π 3 / 4) - 0sin(23 π / 4))) sin(23 2π / 4 x) + (-2 0/ (24 π) cos(24 π 3 / 4) + 4 / (24 π)$^2$ (sin(24 π 3 / 4) - 0sin(24 π / 4))) sin(24 2π / 4 x)

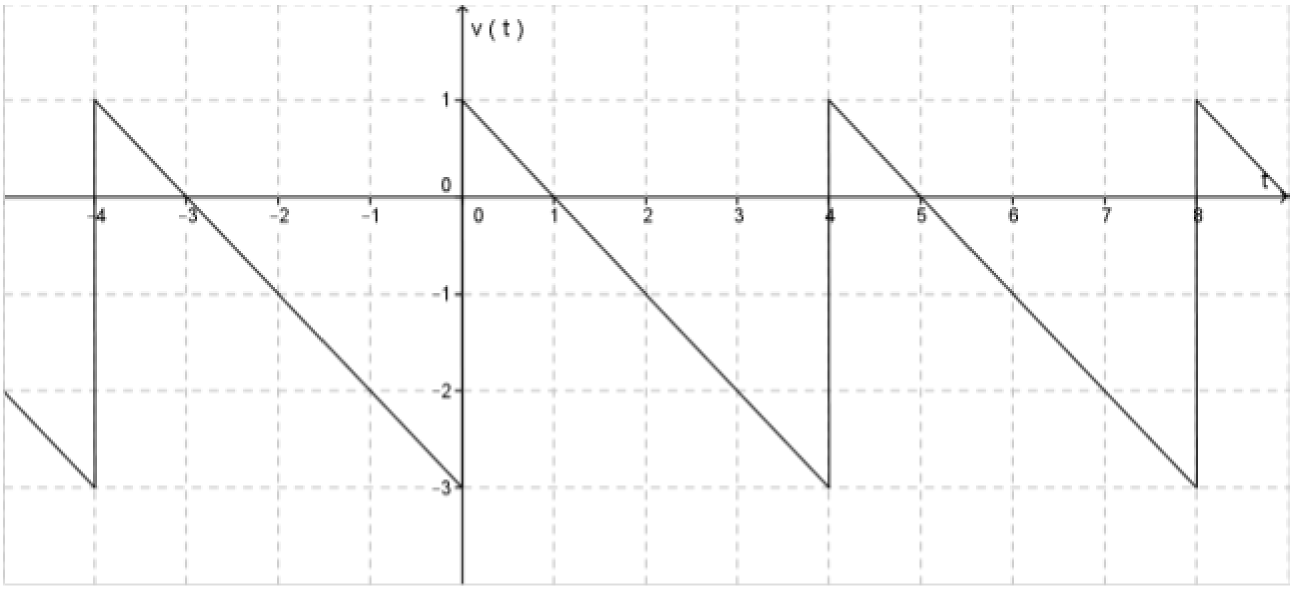
$b_n = -2\,0/ (n \pi) \cos(n \pi\, 3 / 4) + 4 / (n \pi)^2 (0\sin(n \pi\, 3 / 4) - \sin(n \pi / 4))$

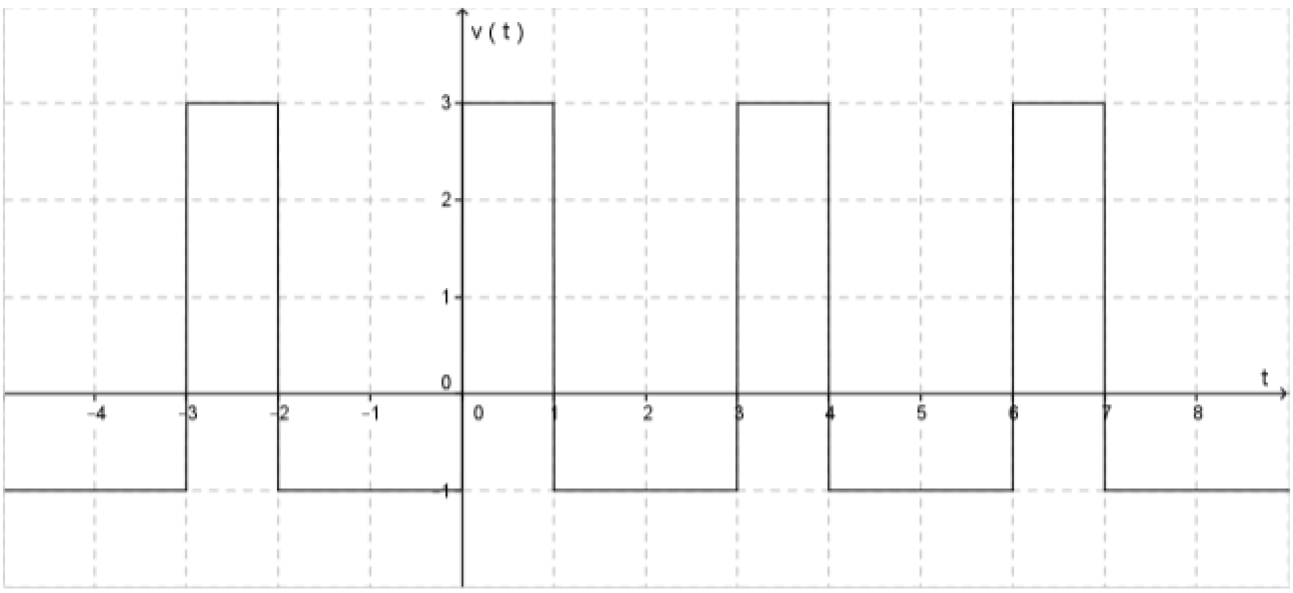
$$
\begin{aligned}
ff4(x) = {} & (-2\,0/ (1 \pi) \cos(1 \pi\, 3 / 4) + 4 / (1 \pi)^2 (0\sin(1 \pi\, 3 / 4) - \sin(1 \pi / 4))) \sin(1\, 2\pi / 4\, x) \\
& + (-2\,0/ (2 \pi) \cos(2 \pi\, 3 / 4) + 4 / (2 \pi)^2 (0\sin(2 \pi\, 3 / 4) - \sin(2 \pi / 4))) \sin(2\, 2\pi / 4\, x) \\
& + (-2\,0/ (3 \pi) \cos(3 \pi\, 3 / 4) + 4 / (3 \pi)^2 (0\sin(3 \pi\, 3 / 4) - \sin(3 \pi / 4))) \sin(3\, 2\pi / 4\, x) \\
& + (-2\,0/ (4 \pi) \cos(4 \pi\, 3 / 4) + 4 / (4 \pi)^2 (0\sin(4 \pi\, 3 / 4) - \sin(4 \pi / 4))) \sin(4\, 2\pi / 4\, x) \\
& + (-2\,0/ (5 \pi) \cos(5 \pi\, 3 / 4) + 4 / (5 \pi)^2 (0\sin(5 \pi\, 3 / 4) - \sin(5 \pi / 4))) \sin(5\, 2\pi / 4\, x) \\
& + (-2\,0/ (6 \pi) \cos(6 \pi\, 3 / 4) + 4 / (6 \pi)^2 (0\sin(6 \pi\, 3 / 4) - \sin(6 \pi / 4))) \sin(6\, 2\pi / 4\, x) \\
& + (-2\,0/ (7 \pi) \cos(7 \pi\, 3 / 4) + 4 / (7 \pi)^2 (0\sin(7 \pi\, 3 / 4) - \sin(7 \pi / 4))) \sin(7\, 2\pi / 4\, x) \\
& + (-2\,0/ (8 \pi) \cos(8 \pi\, 3 / 4) + 4 / (8 \pi)^2 (0\sin(8 \pi\, 3 / 4) - \sin(8 \pi / 4))) \sin(8\, 2\pi / 4\, x) \\
& + (-2\,0/ (9 \pi) \cos(9 \pi\, 3 / 4) + 4 / (9 \pi)^2 (0\sin(9 \pi\, 3 / 4) - \sin(9 \pi / 4))) \sin(9\, 2\pi / 4\, x) \\
& + (-2\,0/ (10 \pi) \cos(10 \pi\, 3 / 4) + 4 / (10 \pi)^2 (0\sin(10 \pi\, 3 / 4) - \sin(10 \pi / 4))) \sin(10\, 2\pi / 4\, x) \\
& + (-2\,0/ (11 \pi) \cos(11 \pi\, 3 / 4) + 4 / (11 \pi)^2 (0\sin(11 \pi\, 3 / 4) - \sin(11 \pi / 4))) \sin(11\, 2\pi / 4\, x) \\
& + (-2\,0/ (12 \pi) \cos(12 \pi\, 3 / 4) + 4 / (12 \pi)^2 (0\sin(12 \pi\, 3 / 4) - \sin(12 \pi / 4))) \sin(12\, 2\pi / 4\, x) \\
& + (-2\,0/ (13 \pi) \cos(13 \pi\, 3 / 4) + 4 / (13 \pi)^2 (0\sin(13 \pi\, 3 / 4) - \sin(13 \pi / 4))) \sin(13\, 2\pi / 4\, x) \\
& + (-2\,0/ (14 \pi) \cos(14 \pi\, 3 / 4) + 4 / (14 \pi)^2 (0\sin(14 \pi\, 3 / 4) - \sin(14 \pi / 4))) \sin(14\, 2\pi / 4\, x) \\
& + (-2\,0/ (15 \pi) \cos(15 \pi\, 3 / 4) + 4 / (15 \pi)^2 (0\sin(15 \pi\, 3 / 4) - \sin(15 \pi / 4))) \sin(15\, 2\pi / 4\, x) \\
& + (-2\,0/ (16 \pi) \cos(16 \pi\, 3 / 4) + 4 / (16 \pi)^2 (0\sin(16 \pi\, 3 / 4) - \sin(16 \pi / 4))) \sin(16\, 2\pi / 4\, x) \\
& + (-2\,0/ (17 \pi) \cos(17 \pi\, 3 / 4) + 4 / (17 \pi)^2 (0\sin(17 \pi\, 3 / 4) - \sin(17 \pi / 4))) \sin(17\, 2\pi / 4\, x) \\
& + (-2\,0/ (18 \pi) \cos(18 \pi\, 3 / 4) + 4 / (18 \pi)^2 (0\sin(18 \pi\, 3 / 4) - \sin(18 \pi / 4))) \sin(18\, 2\pi / 4\, x) \\
& + (-2\,0/ (19 \pi) \cos(19 \pi\, 3 / 4) + 4 / (19 \pi)^2 (0\sin(19 \pi\, 3 / 4) - \sin(19 \pi / 4))) \sin(19\, 2\pi / 4\, x) \\
& + (-2\,0/ (20 \pi) \cos(20 \pi\, 3 / 4) + 4 / (20 \pi)^2 (0\sin(20 \pi\, 3 / 4) - \sin(20 \pi / 4))) \sin(20\, 2\pi / 4\, x) \\
& + (-2\,0/ (21 \pi) \cos(21 \pi\, 3 / 4) + 4 / (21 \pi)^2 (0\sin(21 \pi\, 3 / 4) - \sin(21 \pi / 4))) \sin(21\, 2\pi / 4\, x) \\
& + (-2\,0/ (22 \pi) \cos(22 \pi\, 3 / 4) + 4 / (22 \pi)^2 (0\sin(22 \pi\, 3 / 4) - \sin(22 \pi / 4))) \sin(22\, 2\pi / 4\, x) \\
& + (-2\,0/ (23 \pi) \cos(23 \pi\, 3 / 4) + 4 / (23 \pi)^2 (0\sin(23 \pi\, 3 / 4) - \sin(23 \pi / 4))) \sin(23\, 2\pi / 4\, x) \\
& + (-2\,0/ (24 \pi) \cos(24 \pi\, 3 / 4) + 4 / (24 \pi)^2 (0\sin(24 \pi\, 3 / 4) - \sin(24 \pi / 4))) \sin(24\, 2\pi / 4\, x)
\end{aligned}
$$

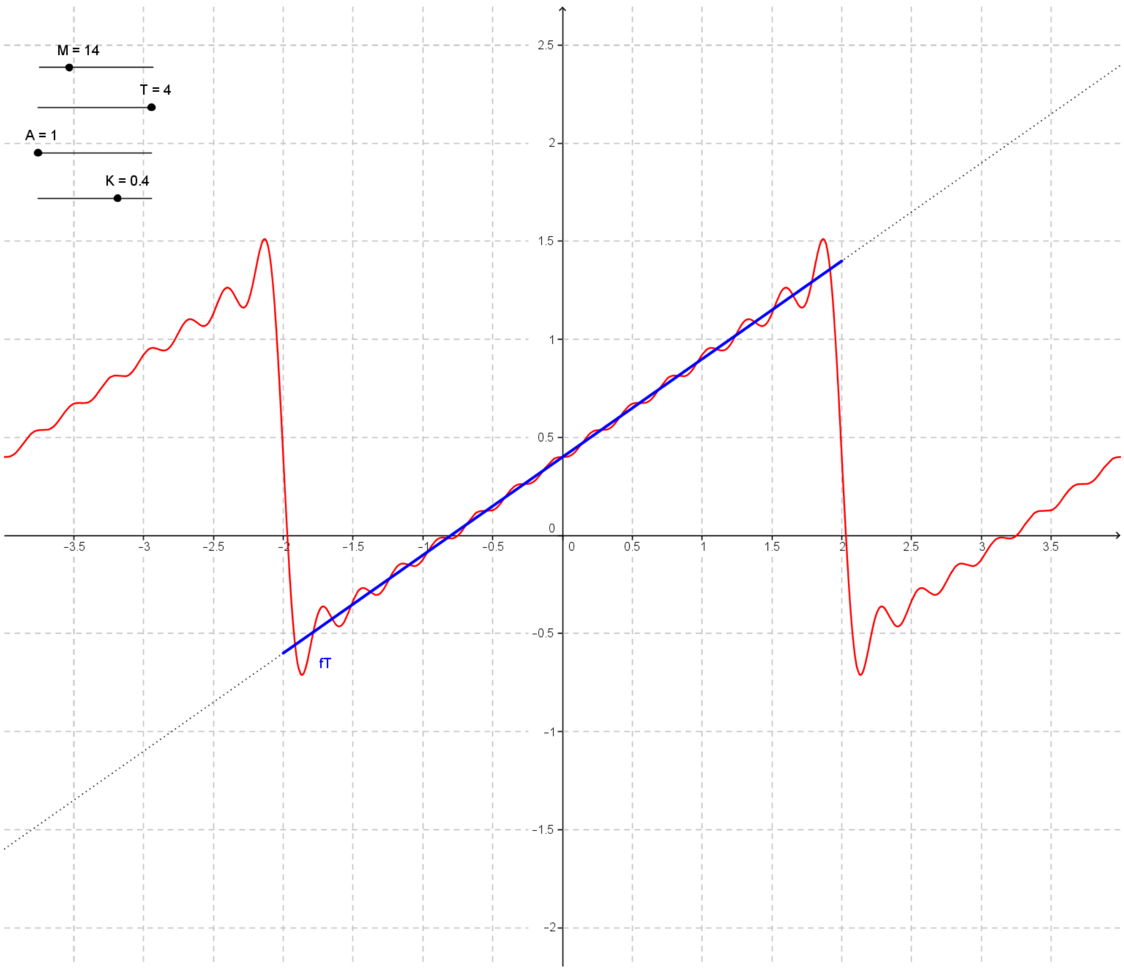


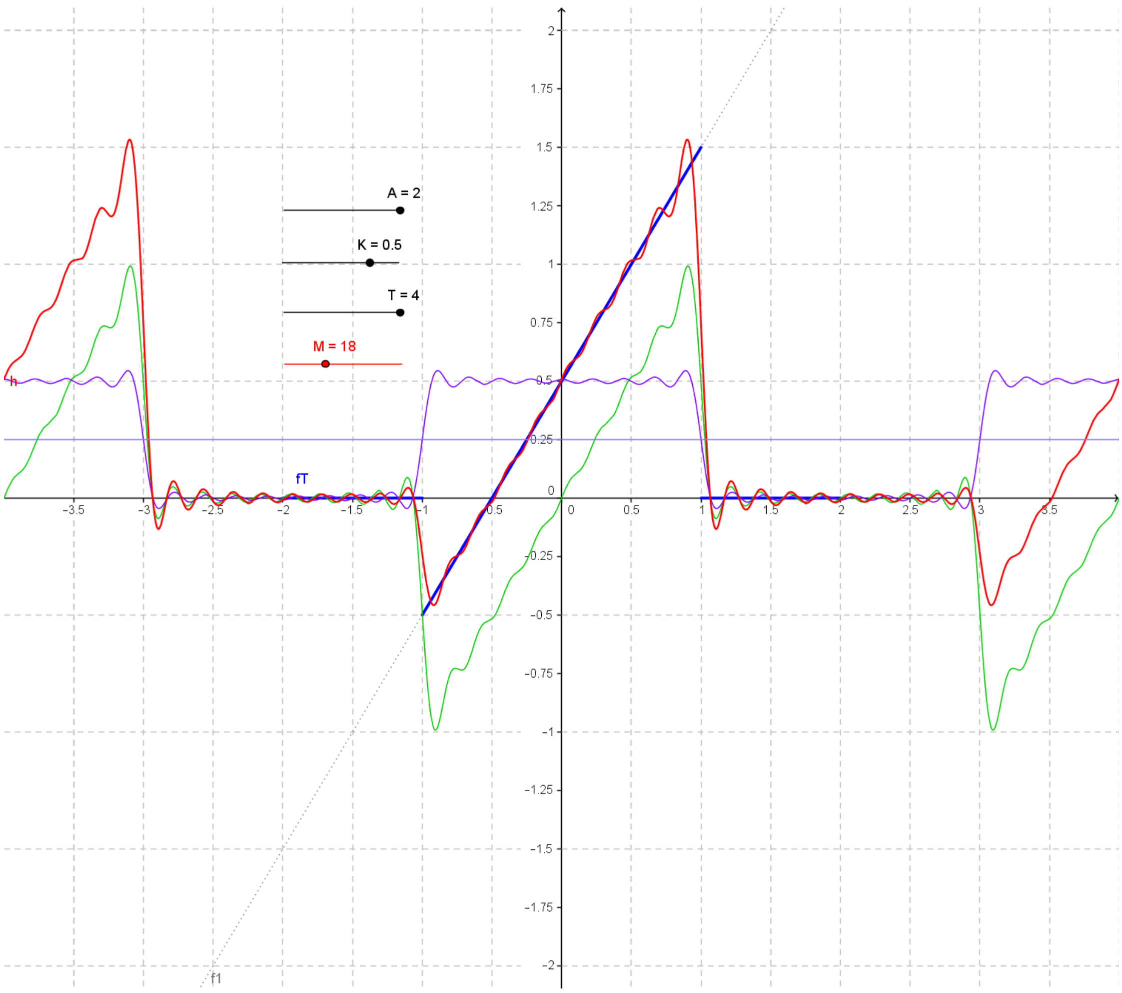
Calcolare il valore efficace $V_{RMS}$ delle seguenti forma d'onda periodiche

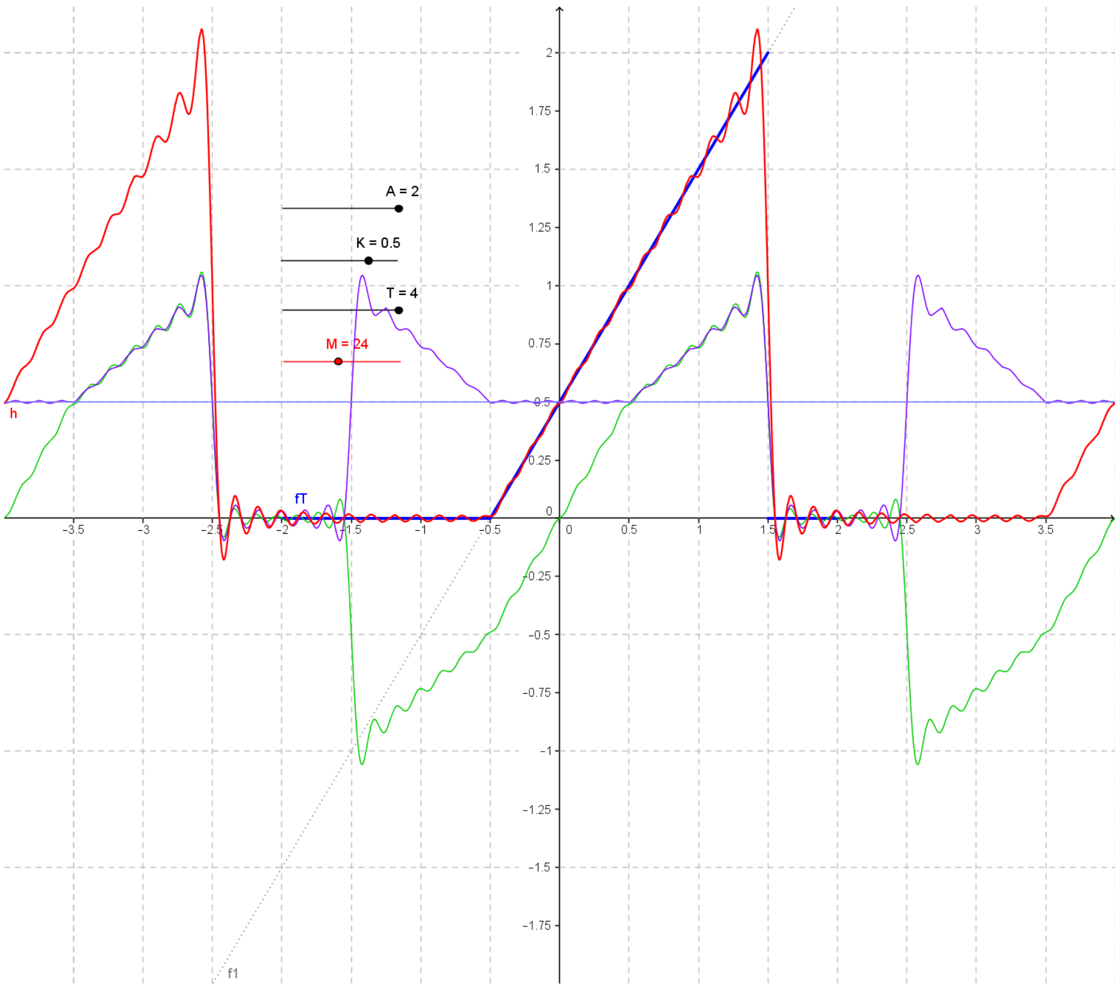


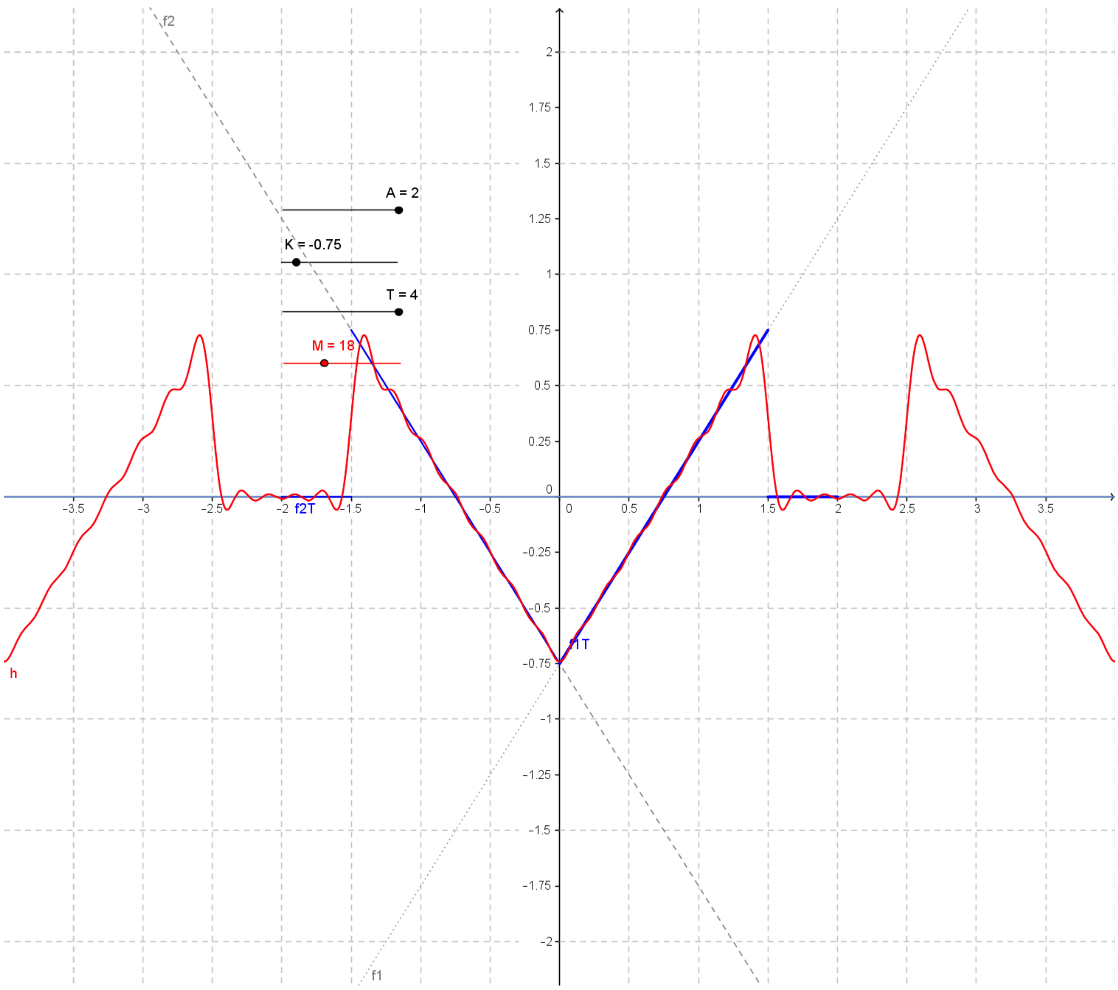




M = 14
T = 4
A = 1
K = 0.4
fT


A = 2
K = 0.5
T = 4
M = 18
h
fT
f1


A = 2
K = 0.5
T = 4
M = 24
h
fT
f1

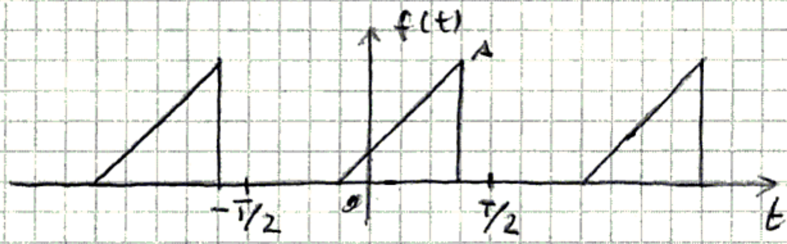

f2
A = 2
K = -0.75
T = 4
M = 18
h
f2T
f1T
f1

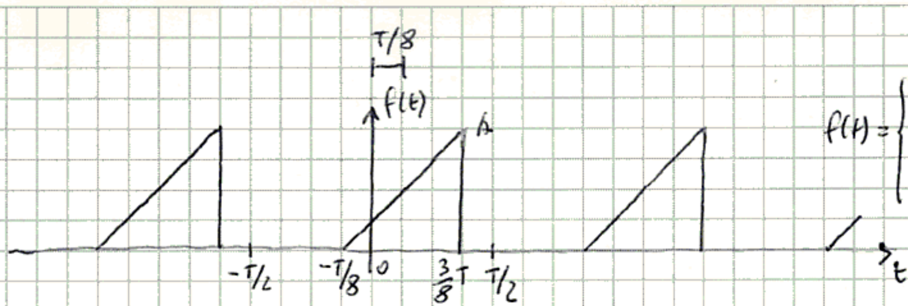
- NOME

- SCOMPORRE LA FUNZIONE PERIODICA ASSEGNATA NELLA SOMMA DI UNA FUNZIONE PARI E DI UNA FUNZIONE DISPARI.

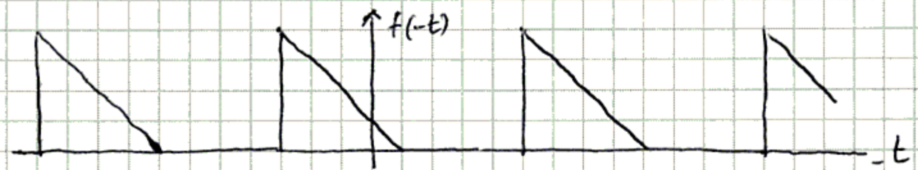
- SCRIVERE LE RELAZIONI CHE CONSENTONO IL CALCOLO DELLO SVILUPPO IN SERIE DELLA FUNZIONE PERIODICA ASSEGNATA.
(RISOLVERE FINO AL CALCOLO INDEFINITO DEGLI INTEGRALI)

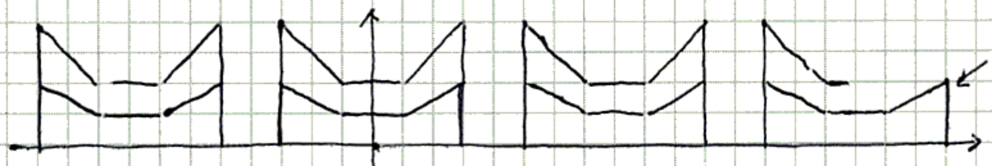
- DETERMINARE IL VALORE NUMERICO DEL VALOR MEDIO E DEL VALORE EFFICACE DELLA FUNZIONE ASSEGNATA
(CAMBIANDO L'ORIGINE DI UNA F.d.O. IL VALOR MEDIO E IL VALORE EFFICACE NON CAMBIANO)





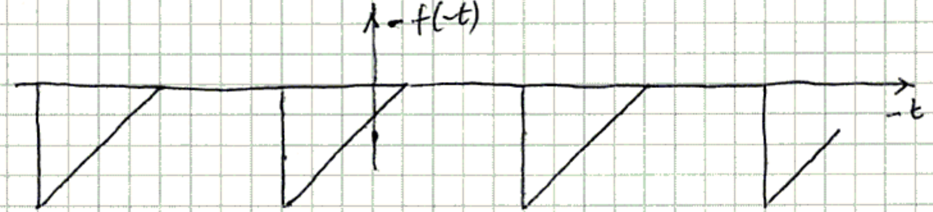

$$f(t) = \begin{cases} \frac{2A}{T}t + \frac{A}{4} & -\frac{T}{8} < t < \frac{3}{8}T \\ 0 & \text{ALTROVE} \end{cases}$$

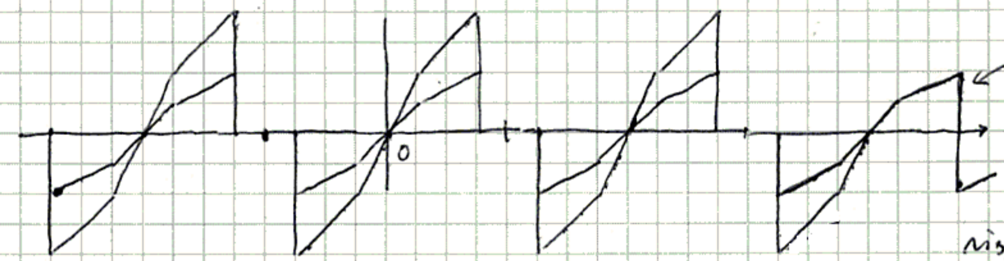


$$f_p = \frac{f(t)+f(-t)}{2}$$

f d0 simmetrica rispetto all'asse $t=0$




$$f_d = \frac{f(t)-f(-t)}{2}$$

f d0 simmetrica rispetto all'origine $t=0$

$$f(t) = f_p + f_d = \frac{f(t)+f(-t)}{2} + \frac{f(t)-f(-t)}{2}$$

$$A_0 = \frac{1}{T}\int_T f(t)\,dt = \frac{1}{T}\int_{-T/8}^{\frac{3}{8}T}\left(\frac{2A}{T}t + \frac{A}{4}\right)dt = \frac{1}{T}\left[\frac{A}{T}t^2 + \frac{A}{4}t\right]_{-T/8}^{\frac{3}{8}T} = \text{----}$$

$$a_n = \frac{2}{T}\int_{-T/8}^{\frac{3}{8}T}\left(\frac{2A}{T}t + \frac{A}{4}\right)\cos n\omega t\,dt = \frac{4A}{T^2}\int_{-T/8}^{\frac{3}{8}T} t\cos n\omega t\,dt + \frac{A}{2T}\int_{-T/8}^{\frac{3}{8}T}\cos n\omega t\,dt =$$

$$= \frac{4A}{T^2}\left[t\frac{\sin n\omega t}{n\omega} + \frac{\cos n\omega t}{(n\omega)^2}\right]_{-T/8}^{\frac{3}{8}T} + \frac{A}{2T}\left.\frac{\sin n\omega t}{n\omega}\right|_{-T/8}^{\frac{3}{8}T} = \text{----}$$

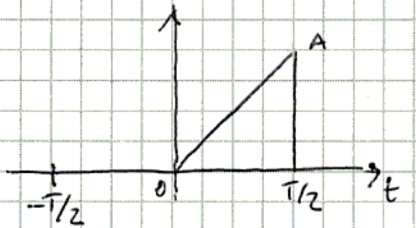
$$b_n = \frac{2}{T}\int_{-T/8}^{\frac{3}{8}T}\left(\frac{2A}{T}t + \frac{A}{4}\right)\sin n\omega t\,dt = \frac{4A}{T^2}\int_{-T/8}^{\frac{3}{8}T} t\sin n\omega t\,dt + \frac{A}{2T}\int_{-T/8}^{\frac{3}{8}T}\sin n\omega t\,dt =$$

$$= \frac{4A}{T^2}\left[-t\frac{\cos n\omega t}{n\omega} + \frac{\sin n\omega t}{(n\omega)^2}\right]_{-T/8}^{\frac{3}{8}T} - \frac{A}{2T}\left.\frac{\cos n\omega t}{n\omega}\right|_{-T/8}^{\frac{3}{8}T} = \text{----}$$

VALOR MEDIO E VALORE EFFICACE

valor medio e valore efficace non dipendono dall'origine delle fdO

cambiando l'origine



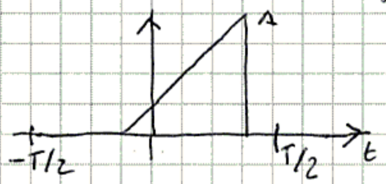

$$v(t) = \begin{cases} \frac{2A}{T} t & 0 < t < \frac{T}{2} \\ 0 & \text{ALTROVE} \end{cases}$$

VALOR MEDIO $V_m = \frac{1}{T} \int_0^{T/2} \frac{2A}{T} t \, dt = \frac{A}{T^2} t^2 \Big|_0^{T/2} = \frac{A}{T^2} \cdot \frac{T^2}{4} = \frac{A}{4}$

VALORE EFFICACE $V_{RMS} = \sqrt{\frac{1}{T} \int_0^{T/2} \left(\frac{2A}{T} t\right)^2 dt} = \sqrt{\frac{4A^2}{T^3} \frac{t^3}{3} \Big|_0^{T/2}} = A \sqrt{\frac{\cancel{4}^{1}}{\cancel{T^3}_{1}} \cdot \frac{1}{3} \frac{\cancel{T^3}^{1}}{\cancel{8}_{2}}} = \frac{A}{\sqrt{6}}$

\- CIO' CHE SEGUE NON ERA RICHIESTO

mantenendo l'origine come nella funzione assegnata




$$v(t) = \begin{cases} \frac{2A}{T} t + \frac{A}{4} & -\frac{T}{8} < t < \frac{3}{8} T \\ 0 & \text{ALTROVE} \end{cases}$$

VALORE EFFICACE

$$V_{RMS} = \sqrt{\frac{1}{T} \int_T \left(\frac{2A}{T} t + \frac{A}{4}\right)^2 dt} = \sqrt{\frac{1}{T} \int_{-T/8}^{\frac{3}{8}T} \left(\frac{4A^2}{T^2} t^2 + 2 \cdot \frac{A}{4} \cdot \frac{2A}{T} t + \frac{A^2}{16}\right) dt} =$$

$$= \sqrt{\frac{1}{T} \left[\frac{4A^2}{T^2} \frac{t^3}{3} + \frac{A^2}{T} \frac{t^2}{2} + \frac{A^2}{16} t\right]_{-T/8}^{\frac{3}{8}T}} = \sqrt{\frac{4}{3} \frac{A^2}{T^3} \left[\frac{27}{512} T^3 + \frac{T^3}{512}\right] + \frac{A^2}{2T^2} \left[\frac{9}{64} T^2 - \frac{1}{64} T^2\right] + \frac{A^2}{16T} \left[\frac{3}{8} T + \frac{T}{8}\right]} =$$

$$= A \sqrt{\frac{\cancel{4}^{1}}{3} \cdot \frac{\cancel{28}^{7}}{\cancel{512}_{\cancel{128}\ 32}} + \frac{1}{2} \frac{\cancel{8}^{1}}{\cancel{64}_{8}} + \frac{1}{16} \cdot \frac{\cancel{4}^{1}}{\cancel{8}_{2}}} = A \sqrt{\frac{7}{96} + \frac{1}{16} + \frac{1}{32}} = A \sqrt{\frac{7+6+3}{96}} = A \sqrt{\frac{16}{96}} = \frac{A}{\sqrt{6}}$$

VALOR MEDIO

il valor medio si ricava proseguendo il calcolo di $A_0$ lasciato in sospeso

$$A_0 = \text{- - - -} = \frac{1}{T} A \left[\frac{1}{\cancel{T}} \frac{9}{64} T^{\cancel{2}} + \frac{1}{4} \frac{3}{8} T - \frac{1}{\cancel{T}} \frac{T^{\cancel{2}}}{64} + \frac{1}{4} \cdot \frac{1}{8} T\right] =$$

$$= A \left[\frac{9}{64} + \frac{3}{32} - \frac{1}{64} + \frac{1}{32}\right] = A \frac{9+6-1+2}{64} = \frac{16}{64} A = \frac{1}{4} A$$

VALOR MEDIO E VALORE EFFICACE calcolati in questo modo sono naturalmente uguali a quelli determinati precedentemente, in modo + semplice e rapido, con la funzione traslata nel tempo -

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continuando il calcolo dei coefficienti $a_n$ e $b_n$ lasciati in sospeso

$$a_n = \dots = \frac{4A}{T^2}\left[\frac{3}{8}T\,\frac{\sin n\omega\frac{3}{8}T}{n\omega} + \frac{\cos n\frac{3}{8}T}{(n\omega)^2} - \left(+\frac{1}{8}T\right)\frac{\sin(+n\omega T/8)}{n\omega} - \frac{\cos n\omega T/8}{(n\omega)^2}\right] + \frac{A}{2Tn\omega}\left(\sin n\omega\frac{3}{8}T + \sin n\omega\frac{T}{8}\right) =$$

$$n\omega = 2\pi \quad , \quad \omega\frac{3}{8}T = \frac{3}{4}\pi \quad , \quad \omega\frac{1}{8}T = \pi/4$$

$$= \frac{\cancel{4}^{2}A}{n\cancel{2}\pi}\left(\frac{3}{8}\sin n\frac{3}{4}\pi - \frac{1}{8}\sin n\frac{\pi}{4}\right) + \frac{\cancel{4}^{1}A}{{}_{1}\cancel{4}n^2\pi^2}\left(\cos n\frac{3}{4}\pi - \cos n\frac{\pi}{4}\right) + \frac{A}{4n\pi}\left(\sin n\frac{3}{4}\pi + \sin n\frac{\pi}{4}\right) =$$

$$= \frac{A}{4n\pi}\left(3\sin n\frac{3}{4}\pi - \cancel{\sin n\frac{\pi}{4}} + \sin n\frac{3}{4}\pi + \cancel{\sin n\frac{\pi}{4}}\right) + \frac{A}{n^2\pi^2}\left(\cos n\frac{3}{4}\pi - \cos n\frac{\pi}{4}\right) =$$

$$= \frac{A}{4n\pi}\left(4\sin n\frac{3}{4}\pi\right) + \frac{A}{n^2\pi^2}\left(\cos n\frac{3}{4}\pi - \cos n\frac{\pi}{4}\right) =$$

$$= \frac{A}{n\pi}\sin n\frac{3}{4}\pi + \frac{A}{n^2\pi^2}\left(\cos n\frac{3}{4}\pi - \cos n\frac{\pi}{4}\right)$$

$$b_n = \dots = \frac{4A}{T^2}\left[-\frac{3}{8}T\,\frac{\cos n\omega\frac{3}{8}T}{n\omega} + \frac{\sin n\omega\frac{3}{8}T}{(n\omega)^2} + \left(-\frac{T}{8}\right)\frac{\cos n\omega T/8}{n\omega} + \frac{\sin n\omega T/8}{(n\omega)^2}\right] - \frac{A}{2Tn\omega}\left(\cos n\omega\frac{3}{8}T - \cos n\omega\frac{T}{8}\right) =$$

$$= \frac{\cancel{4}^{2}A}{n\cancel{2}\pi}\left(-\frac{3}{8}\cos n\frac{3}{4}\pi - \frac{1}{8}\cos n\frac{\pi}{4}\right) + \frac{\cancel{4}^{1}A}{{}_{1}\cancel{4}n^2\pi^2}\left(\sin n\frac{3}{4}\pi + \sin n\frac{\pi}{4}\right) - \frac{A}{4n\pi}\left(\cos n\frac{3}{4}\pi - \cos n\frac{\pi}{4}\right) =$$

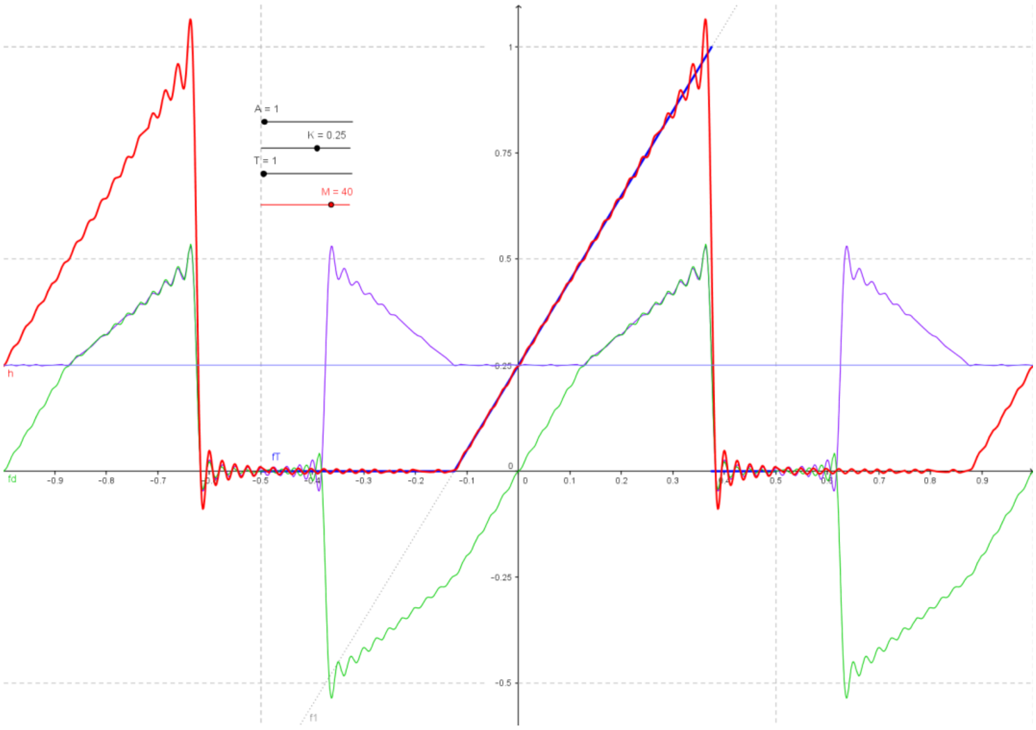
$$= \frac{A}{4n\pi}\left(-3\cos n\frac{3}{4}\pi - \cancel{\cos n\frac{\pi}{4}} - \cos n\frac{3}{4}\pi + \cancel{\cos n\frac{\pi}{4}}\right) + \frac{A}{n^2\pi^2}\left(\sin n\frac{3}{4}\pi + \sin n\frac{\pi}{4}\right) =$$

$$= \frac{A}{4n\pi}\left(-4\cos n\frac{3}{4}\pi\right) + \frac{A}{n^2\pi^2}\left(\sin n\frac{3}{4}\pi + \sin n\frac{\pi}{4}\right) =$$

$$= -\frac{A}{n\pi}\cos n\frac{3}{4}\pi + \frac{A}{n^2\pi^2}\left(\sin n\frac{3}{4}\pi + \sin n\frac{\pi}{4}\right)$$

$$f(t) = \underbrace{A_0 + \sum a_n \cos n\omega t}_{f_p} + \underbrace{\sum b_n \sin n\omega t}_{f_d} = f_p(t) + f_d(t)$$

la successione numerica dei coefficienti $a_n$ e $b_n$ può essere generata utilizzando le espressioni algebriche ricavate dai calcoli effettuati precedentemente OPPURE può essere calcolata molto più rapidamente con GEOGEBRA, il quale esegue direttamente il calcolo numerico degli integrali definiti; in questo modo, però, non è disponibile l'espressione algebrica dei coefficienti stessi.




A = 1
K = 0.25
M = 40
T = 1
f1(x) = 2A / T x + K
f1T =Se[(-1) / 4 T / 2 < x < 3 / 4 T / 2, f1, 0]
fT=Funzione[f1T, (-T) / 2, T / 2]

fpp(x) = 0.25 + (1 / (π) sin(3 / 4 π) + 1 / (1^2 π^2) (cos(3 / 4 π) - cos(1 / 4 π))) cos(2 π x) + (1 / (2π) sin(2 (3 / 4) π) + 1 / (2^2 π^2) (cos(2 (3 / 4) π) - cos(2 (1 / 4) π))) cos(2 (2) π x) + (1 / (3π) sin(3 (3 / 4) π) + 1 / (3^2 π^2) (cos(3 (3 / 4) π) - cos(3 (1 / 4) π))) cos(3 (2) π x) + 0cos(4 (2) π x) + (1 / (5π) sin(5 (3 / 4) π) + 1 / (5^2 π^2) (cos(5 (3 / 4) π) - cos(5 (1 / 4) π))) cos(5 (2) π x) + (1 / (6π) sin(6 (3 / 4) π) + 1 / (6^2 π^2) (cos(6 (3 / 4) π) - cos(6 (1 / 4) π))) cos(6 (2) π x) + (1 / (7π) sin(7 (3 / 4) π) + 1 / (7^2 π^2) (cos(7 (3 / 4) π) - cos(7 (1 / 4) π))) cos(7 (2) π x) + 0cos(8 (2) π x) + (1 / (9π) sin(9 (3 / 4) π) + 1 / (9^2 π^2) (cos(9 (3 / 4) π) - cos(9 (1 / 4) π))) cos(9 (2) π x) + (1 / (10π) sin(10 (3 / 4) π) + 1 / (10^2 π^2) (cos(10 (3 / 4) π) - cos(10 (1 / 4) π))) cos(10 (2) π x) + (1 / (11π) sin(11 (3 / 4) π) + 1 / (11^2 π^2) (cos(11 (3 / 4) π) - cos(11 (1 / 4) π))) cos(11 (2) π x) + 0cos(12 (2) π x) + (1 / (13π) sin(13 (3 / 4) π) + 1 / (13^2 π^2) (cos(13 (3 / 4) π) - cos(13 (1 / 4) π))) cos(13 (2) π x) + (1 / (14π) sin(14 (3 / 4) π) + 1 / (14^2 π^2) (cos(14 (3 / 4) π) - cos(14 (1 / 4) π))) cos(14 (2) π x) + (1 / (15π) sin(15 (3 / 4) π) + 1 / (15^2 π^2) (cos(15 (3 / 4) π) - cos(15 (1 / 4) π))) cos(15 (2) π x) + 0cos(16 (2) π x) + (1 / (17π) sin(17 (3 / 4) π) + 1 / (17^2 π^2) (cos(17 (3 / 4) π) - cos(17 (1 / 4) π))) cos(17 (2) π x) + (1 / (18π) sin(18 (3 / 4) π) + 1 / (18^2 π^2) (cos(18 (3 / 4) π) - cos(18 (1 / 4) π))) cos(18 (2) π x)

fdd(x) = ((-1) / π cos(3 / 4 π) + 1 / (1^2 π^2) (sin(3 / 4 π) + sin(1 / 4 π))) sin(2π x) + 0sin(2 (2) π x) + ((-1) / (3π) cos(3 (3 / 4) π) + 1 / (3^2 π^2) (sin(3 (3 / 4) π) + sin(3 (1 / 4) π))) sin(3 (2) π x) + ((-1) / (4π) cos(4 (3 / 4) π) + 1 / (4^2 π^2) (sin(4 (3 / 4) π) + sin(4 (1 / 4) π))) sin(4 (2) π x) + ((-1) / (5π) cos(5 (3 / 4) π) + 1 / (5^2 π^2) (sin(5 (3 / 4) π) + sin(5 (1 / 4) π))) sin(5 (2) π x) + 0sin(6 (2) π x) + ((-1) / (7π) cos(7 (3 / 4) π) + 1 / (7^2 π^2) (sin(7 (3 / 4) π) + sin(7 (1 / 4) π))) sin(7 (2) π x) + ((-1) / (8π) cos(8 (3 / 4) π) + 1 / (8^2 π^2) (sin(8 (3 / 4) π) + sin(8 (1 / 4) π))) sin(8 (2) π x) + ((-1) / (9π) cos(9 (3 / 4) π) + 1 / (9^2 π^2) (sin(9 (3 / 4) π) + sin(9 (1 / 4) π))) sin(9 (2) π x) + 0sin(10 (2) π x) + ((-1) / (11π) cos(11 (3 / 4) π) + 1 / (11^2 π^2) (sin(11 (3 / 4) π) + sin(11 (1 / 4) π))) sin(11 (2) π x) + ((-1) / (12π) cos(12 (3 / 4) π) + 1 / (12^2 π^2) (sin(12 (3 / 4) π) + sin(12 (1 / 4) π))) sin(12 (2) π x) + ((-1) / (13π) cos(13 (3 / 4) π) + 1 / (13^2 π^2) (sin(13 (3 / 4) π) + sin(13 (1 / 4) π))) sin(13 (2) π x) + 0sin(14 (2) π x) + ((-1) / (15π) cos(15 (3 / 4) π) + 1 / (15^2 π^2) (sin(15 (3 / 4) π) + sin(15 (1 / 4) π))) sin(15 (2) π x) + ((-1) / (16π) cos(16 (3 / 4) π) + 1 / (16^2 π^2) (sin(16 (3 / 4) π) + sin(16 (1 / 4) π))) sin(16 (2) π x) + ((-1) / (17π) cos(17 (3 / 4) π) + 1 / (17^2 π^2) (sin(17 (3 / 4) π) + sin(17 (1 / 4) π))) sin(17 (2) π x) + 0sin(18 (2) π x)

fs(x) = fpp(x) + fdd(x)

a0 =1 / 4
AA=Successione[1 / (n π) sin(n 3 / 4 π) + 1 / (n^2 π^2) (cos(n 3 / 4 π) - cos(n 1 / 4 π)), n, 1, M]
BB=Successione[-1 / (n π) cos(n 3 / 4 π) + 1 / (n^2 π^2) (sin(n 3 / 4 π) + sin(n 1 / 4 π)), n, 1, M]
fpA=Successione[Elemento[AA, n] cos(n (2π) / T x), n, 1, M]
fdB=Successione[Elemento[BB, n] sin(n (2π) / T x), n, 1, M]
fppA(x) = a0 + Somma[fpA]
fddB(x)=Somma[fdB]
fss(x) = fppA(x) + fddB(x)

a0 =1 / T Integrale[f1T, (-T) / 2, T / 2]
an= Successione[2 / T Integrale[f1(x) cos(n (2π) / T x), (-1) / 4 T / 2, 3 / 4 T / 2], n, 1, M]
bn= Successione[2 / T Integrale[f1(x) sin(n (2π) / T x), (-1) / 4 T / 2, 3 / 4 T / 2], n, 1, M]
fpn= Successione[Elemento[an, n] cos(n (2π) / T x), n, 1, M]
fdn= Successione[Elemento[bn, n] sin(n (2π) / T x), n, 1, M]
fp(x) = a0 + Somma[fpn]
fd(x)= Somma[fdn]
A0(x) = a0
h(x) = fp(x) + fd(x)