$$x(t) = \begin{cases} 2At, & 0 \le t \le T/2 \\ -2A(t-T), & T/2 \le t \le T \end{cases}$$

$$\alpha_0 = \frac{1}{T}\int_0^T x(t)dt = \frac{2A}{T}\left[\int_0^{T/2} t dt - \int_{T/2}^{T}(t-T)dt\right] = \frac{AT}{2}$$

$$\alpha_n = \frac{1}{T}\int_0^T x(t)e^{jn2\pi t/T}dt = \frac{2A}{T}\left[\int_0^{T/2} te^{jn2\pi t/T}dt - \int_{T/2}^{T}(t-T)e^{jn2\pi t/T}dt\right] = \begin{cases} -2AT/n^2\pi^2, & n\ odd \\ 0, & n\ even, n \ne 0 \end{cases}$$

(A lot of combinations and cancellations occur in this one.)

$$x(t) = \begin{cases} A\sin(2\pi t/T), & 0 \le t \le T/2 \\ 0, & T/2 \le t \le T \end{cases}$$

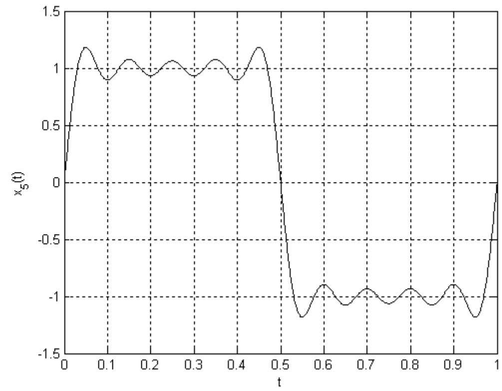
$$\alpha_0 = \frac{1}{T}\int_0^T x(t)dt = \frac{A}{T}\int_0^{T/2}\sin(2\pi t/T)dt = \frac{A}{\pi}$$

$$\alpha_n = \frac{1}{T}\int_0^T x(t)e^{jn2\pi t/T}dt = \frac{A}{T}\int_0^{T/2}\sin(2\pi t/T)e^{jn2\pi t/T}dt = \frac{A}{j2T}\int_0^{T/2}\left[e^{j2\pi t/T} - e^{-j2\pi t/T}\right]e^{jn2\pi t/T}dt$$

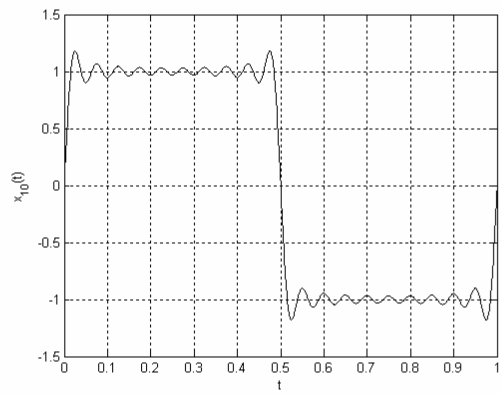
$$= \begin{cases} -A/\pi(n^2-1), & n\ even \\ 0, & n\ odd \end{cases}$$

(Again, some convenient combinations occur.)

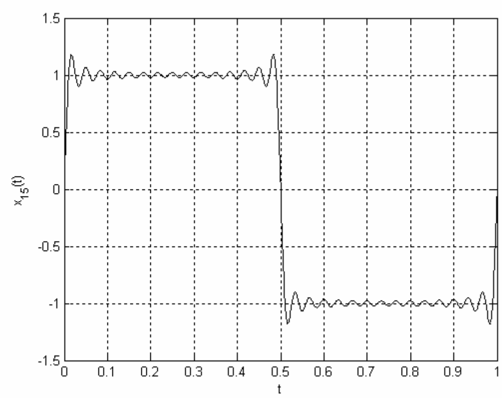
$$x_5(t) = \frac{4}{\pi}\sum_{n=1}^{5}\frac{1}{2n-1}\sin(2\pi(2n-1)t)$$



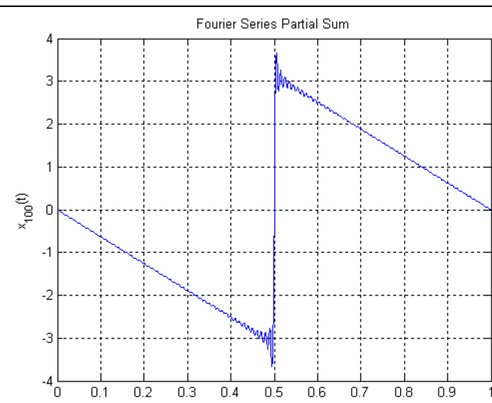
$$x_{10}(t) = \frac{4}{\pi}\sum_{n=1}^{10}\frac{1}{2n-1}\sin(2\pi(2n-1)t)$$



$$x_{15}(t) = \frac{4}{\pi}\sum_{n=1}^{15}\frac{1}{2n-1}\sin(2\pi(2n-1)t)$$



$$\begin{aligned} x(t) &= \sum_{\substack{n=-\infty \\ n\neq 0}}^{\infty}\frac{(-1)^n}{jn}e^{jn2\pi t/T} \\ &= \sum_{n=1}^{\infty}\frac{(-1)^n}{jn}\left[e^{jn2\pi t/T} - e^{-jn2\pi t/T}\right] \\ &= \sum_{n=1}^{\infty}\frac{2(-1)^n}{n}\sin(n2\pi t/T) \end{aligned}$$



```
x=zeros(1000,1);  % 1000 points in the interval.
N=500;            % N terms in the partial sum.
for n=1:N
    for k=1:1000
        x(k)=x(k)+((2*(-1)^n)/(n*n))*cos(n*2*pi*k/1000);
    end
end
plot(x)
grid
```

$$
\begin{aligned}
x(t) &= \sum_{\substack{n=-\infty \\ n\neq 0}}^{\infty} \frac{(-1)^n}{n^2} e^{jn2\pi t/T} \\
&= \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2} \left[e^{jn2\pi t/T} + e^{-jn2\pi t/T} \right] \\
&= \sum_{n=1}^{\infty} \frac{2(-1)^n}{n^2} \cos(n2\pi t/T)
\end{aligned}
$$