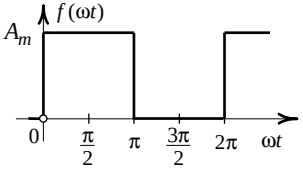
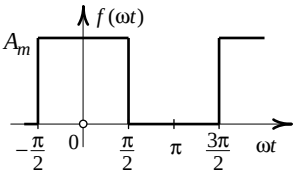
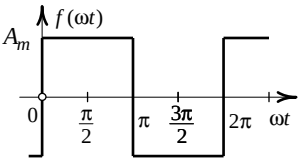
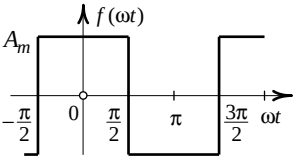
Графики типовых несинусоидальных функций и их разложение в тригонометрический ряд Фурье

График несинусоидальной функции	Разложение функции в ряд Фурье
 *Рис. П1*	$$f(\omega t) = \frac{A_m}{2} + \frac{2A_m}{\pi}\left(\sin\omega t + \frac{\sin 3\omega t}{3} + \right.$$ $$\left. + \frac{\sin 5\omega t}{5} + \frac{\sin 7\omega t}{7} + \frac{\sin 9\omega t}{9} + \ldots\right)$$
 *Рис. П2*	$$f(\omega t) = \frac{A_m}{2} + \frac{2A_m}{\pi}\left(\cos\omega t - \frac{\cos 3\omega t}{3} + \right.$$ $$\left. + \frac{\cos 5\omega t}{5} - \frac{\cos 7\omega t}{7} + \frac{\cos 9\omega t}{9} + \ldots\right)$$
 *Рис. П3*	$$f(\omega t) = \frac{4A_m}{\pi}\left(\sin\omega t + \frac{\sin 3\omega t}{3} + \frac{\sin 5\omega t}{5} + \right.$$ $$\left. + \frac{\sin 7\omega t}{7} + \frac{\sin 9\omega t}{9} + \ldots\right)$$
 *Рис. П4*	$$f(\omega t) = \frac{4A_m}{\pi}\left(\cos\omega t - \frac{\cos 3\omega t}{3} + \frac{\cos 5\omega t}{5} - \right.$$ $$\left. - \frac{\cos 7\omega t}{7} + \frac{\cos 9\omega t}{9} - \ldots\right)$$

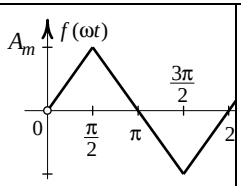


Рис. П5

$$f(\omega t) = \frac{8A_m}{\pi^2}\left(\sin\omega t - \frac{\sin 3\omega t}{9} + \frac{\sin 5\omega t}{25} - \right.$$
$$\left. - \frac{\sin 7\omega t}{49} + \frac{\sin 9\omega t}{81} - \ldots\right)$$

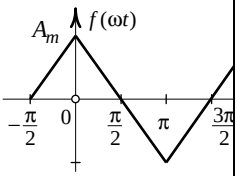


Рис. П6

$$f(\omega t) = \frac{8A_m}{\pi^2}\left(\cos\omega t + \frac{\cos 3\omega t}{9} + \frac{\cos 5\omega t}{25} + \right.$$
$$\left. + \frac{\cos 7\omega t}{49} + \frac{\cos 9\omega t}{81} + \ldots\right)$$

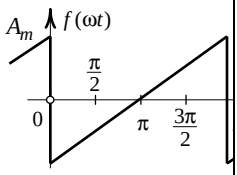


Рис. П7

$$f(\omega t) = \frac{2A_m}{\pi}\left(-\sin\omega t - \frac{\sin 2\omega t}{2} - \frac{\sin 3\omega t}{3} - \right.$$
$$\left. - \frac{\sin 4\omega t}{4} - \frac{\sin 5\omega t}{5} - \ldots\right)$$

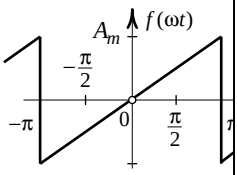


Рис. П8

$$f(\omega t) = \frac{2A_m}{\pi}\left(\sin\omega t - \frac{\sin 2\omega t}{2} + \frac{\sin 3\omega t}{3} - \right.$$
$$\left. - \frac{\sin 4\omega t}{4} + \frac{\sin 5\omega t}{5} - \ldots\right)$$

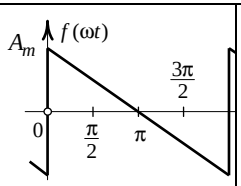


Рис. П9

$$f(\omega t) = \frac{2A_m}{\pi}\left(\sin\omega t + \frac{\sin 2\omega t}{2} + \frac{\sin 3\omega t}{3} + \right.$$
$$\left. + \frac{\sin 4\omega t}{4} + \frac{\sin 5\omega t}{5} + \ldots\right)$$

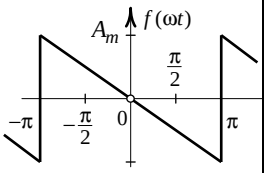


Рис. П10

$$f(\omega t) = \frac{2A_m}{\pi}\left(-\sin\omega t + \frac{\sin 2\omega t}{2} - \frac{\sin 3\omega t}{3} + \right.$$
$$\left. + \frac{\sin 4\omega t}{4} - \frac{\sin 5\omega t}{5} + \ldots\right)$$

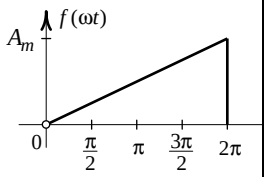


Рис. П11

$$f(\omega t) = \frac{A_m}{2} - \frac{A_m}{\pi}\left(\sin\omega t + \frac{\sin 2\omega t}{2} + \right.$$
$$\left. + \frac{\sin 3\omega t}{3} + \frac{\sin 4\omega t}{4} + \frac{\sin 5\omega t}{5} + \ldots\right)$$

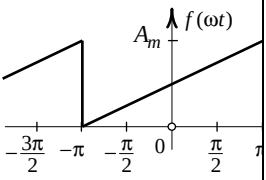


Рис. П12

$$f(\omega t) = \frac{A_m}{2} + \frac{A_m}{\pi}\left(\sin\omega t - \frac{\sin 2\omega t}{2} + \right.$$
$$\left. + \frac{\sin 3\omega t}{3} - \frac{\sin 4\omega t}{4} + \frac{\sin 5\omega t}{5} - \ldots\right)$$

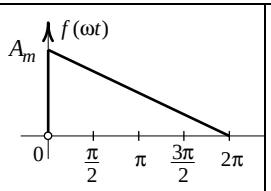


Рис. П13

$$f(\omega t) = \frac{A_m}{2} + \frac{A_m}{\pi}\left(\sin\omega t + \frac{\sin 2\omega t}{2} + \right.$$
$$\left. + \frac{\sin 3\omega t}{3} + \frac{\sin 4\omega t}{4} + \frac{\sin 5\omega t}{5} + \ldots\right)$$

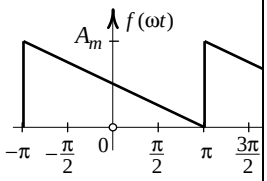


Рис. П14

$$f(\omega t) = \frac{A_m}{2} + \frac{A_m}{\pi}\left(-\sin\omega t + \frac{\sin 2\omega t}{2} - \right.$$
$$\left. - \frac{\sin 3\omega t}{3} + \frac{\sin 4\omega t}{4} - \frac{\sin 5\omega t}{5} + \ldots\right)$$

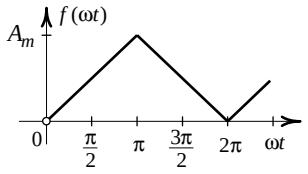


Рис. П15

$$f(\omega t) = \frac{A_m}{2} - \frac{4A_m}{\pi^2}\left(\cos\omega t + \frac{\cos 3\omega t}{9} + \right.$$
$$\left. + \frac{\cos 5\omega t}{25} + \frac{\cos 7\omega t}{49} + \frac{\cos 9\omega t}{81} + \ldots\right)$$

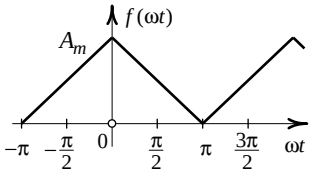
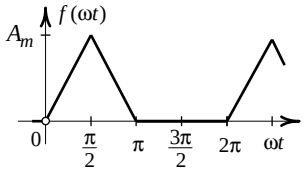


Рис. П16

$$f(\omega t) = \frac{A_m}{2} + \frac{4A_m}{\pi^2}\left(\cos\omega t + \frac{\cos 3\omega t}{9} + \right.$$
$$\left. + \frac{\cos 5\omega t}{25} + \frac{\cos 7\omega t}{49} + \frac{\cos 9\omega t}{81} + \ldots\right)$$



$$f(\omega t) = \frac{A_m}{4} + \frac{4A_m}{\pi^2}\left(\sin\omega t - \frac{\cos 2\omega t}{2} - \right.$$
$$\left. - \frac{\sin 3\omega t}{9} + \frac{\sin 5\omega t}{25} - \frac{\cos 6\omega t}{18} - \ldots\right)$$

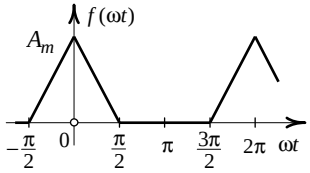
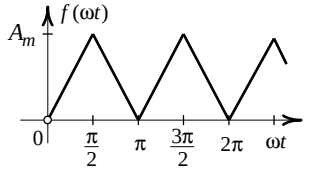
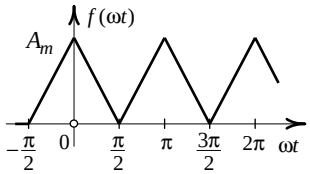
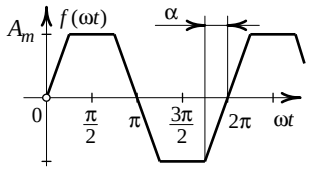
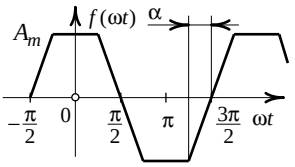
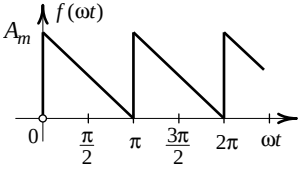
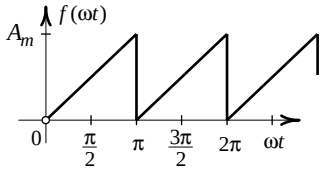
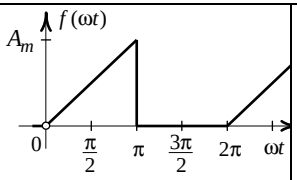
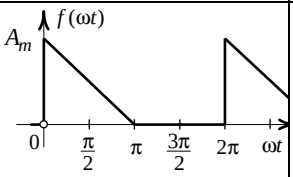
Рис. П17	
 *Рис. П18*	$$f(\omega t)=\frac{A_m}{4}+\frac{4A_m}{\pi^2}\left(\cos\omega t+\frac{\cos 2\omega t}{2}+\right.$$ $$\left.+\frac{\cos 3\omega t}{9}+\frac{\cos 5\omega t}{25}+\frac{\cos 6\omega t}{18}+\ldots\right)$$
 *Рис. П19*	$$f(\omega t)=\frac{A_m}{2}-\frac{4A_m}{\pi^2}\left(\cos 2\omega t+\frac{\cos 6\omega t}{9}+\right.$$ $$\left.+\frac{\cos 10\omega t}{25}+\frac{\cos 14\omega t}{49}+\frac{\cos 18\omega t}{81}+\ldots\right)$$
 *Рис. П20*	$$f(\omega t)=\frac{A_m}{2}+\frac{4A_m}{\pi^2}\left(\cos 2\omega t+\frac{\cos 6\omega t}{9}+\right.$$ $$\left.+\frac{\cos 10\omega t}{25}+\frac{\cos 14\omega t}{49}+\frac{\cos 18\omega t}{81}+\ldots\right)$$
 *Рис. П21*	$$f(\omega t)=\frac{4A_m}{\alpha\pi}\left(\sin\alpha\sin\omega t+\frac{\sin 3\alpha\sin 3\omega t}{9}+\right.$$ $$\left.+\frac{\sin 5\alpha\sin 5\omega t}{25}+\frac{\sin 7\alpha\sin 7\omega t}{49}+\ldots\right)$$
	$$f(\omega t)=\frac{4A_m}{\alpha\pi}\left(\sin\alpha\cos\omega t-\frac{\sin 3\alpha\cos 3\omega t}{9}+\right.$$ $$\left.+\frac{\sin 5\alpha\cos 5\omega t}{25}-\frac{\sin 7\alpha\cos 7\omega t}{49}+\ldots\right)$$

Рис. П22	
 *Рис. П23*	$$f(\omega t) = \frac{A_m}{2} + \frac{A_m}{\pi}\left(\sin 2\omega t + \frac{\sin 4\omega t}{2} + \right.$$ $$\left. + \frac{\sin 6\omega t}{3} + \frac{\sin 8\omega t}{4} + \frac{\sin 10\omega t}{5} + \ldots\right)$$
 *Рис. П24*	$$f(\omega t) = \frac{A_m}{2} - \frac{A_m}{\pi}\left(\sin 2\omega t + \frac{\sin 4\omega t}{2} + \right.$$ $$\left. + \frac{\sin 6\omega t}{3} + \frac{\sin 8\omega t}{4} + \frac{\sin 10\omega t}{5} + \ldots\right)$$
 *Рис. П25*	$$f(\omega t) = \frac{A_m}{4} - 2A_m\left(\frac{\cos \omega t}{\pi^2} - \frac{\sin \omega t}{2\pi} + \right.$$ $$\left. + \frac{\sin 2\omega t}{4\pi} + \frac{\cos 3\omega t}{9\pi^2} - \frac{\sin 3\omega t}{6\pi} + \ldots\right)$$
 *Рис. П26*	$$f(\omega t) = \frac{A_m}{4} + 2A_m\left(\frac{\cos \omega t}{\pi^2} + \frac{\sin \omega t}{2\pi} + \right.$$ $$\left. + \frac{\sin 2\omega t}{4\pi} + \frac{\cos 3\omega t}{9\pi^2} + \frac{\sin 3\omega t}{6\pi} + \ldots\right)$$

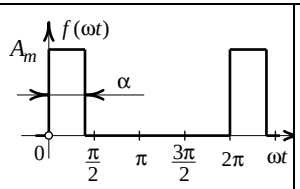


Рис. П27

$$f(\omega t) = \frac{A_m \alpha}{2\pi} + \frac{A_m}{\pi}\left(\sin\alpha\cos\omega t + \right.$$
$$+(1-\cos\alpha)\sin\omega t + \frac{\sin 2\alpha\cos 2\omega t}{2} +$$
$$\left. + \frac{(1-\cos 2\alpha)\sin 2\omega t}{2} + \frac{\sin 3\alpha\cos 3\omega t}{3} + \ldots \right)$$

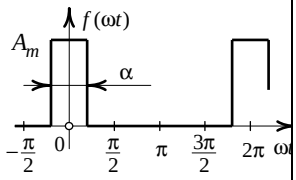


Рис. П28

$$f(\omega t) = \frac{A_m \alpha}{2\pi} + \frac{2A_m}{\pi}\left(\sin\frac{\alpha}{2}\cos\omega t + \right.$$
$$+\frac{1}{2}\sin\alpha\cos 2\omega t + \frac{1}{3}\sin\frac{3\alpha}{2}\cos 3\omega t +$$
$$\left. + \frac{1}{4}\sin 2\alpha\cos 4\omega t + \frac{1}{5}\sin\frac{5\alpha}{2}\cos 5\omega t + \ldots \right)$$

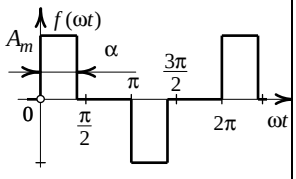


Рис. П29

$$f(\omega t) = \frac{2A_m}{\pi}\left(\sin\alpha\cos\omega t + (1-\cos\alpha)\sin\omega t + \right.$$
$$+\frac{1}{3}\sin 3\alpha\cos 3\omega t + \frac{1}{3}(1-\cos 3\alpha)\sin 3\omega t +$$
$$\left. + \frac{1}{5}\sin 5\alpha\cos 5\omega t + \frac{1}{5}(1-\cos 5\alpha)\sin 5\omega t + \ldots \right)$$

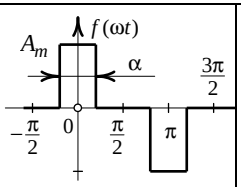


Рис. П30

$$f(\omega t) = \frac{4A_m}{\pi}\left(\sin\frac{\alpha}{2}\cos\omega t + \right.$$
$$+\frac{1}{3}\sin\frac{3\alpha}{2}\cos 3\omega t + \frac{1}{5}\sin\frac{5\alpha}{2}\cos 5\omega t +$$
$$\left. + \frac{1}{7}\sin\frac{7\alpha}{2}\cos 7\omega t + \ldots \right)$$

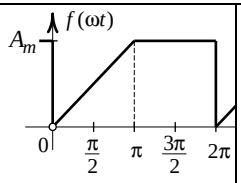


Рис. П31

$$f(\omega t) = \frac{3A_m}{4} - 2A_m\left(\frac{\cos\omega t}{\pi^2} + \frac{\sin\omega t}{2\pi} + \right.$$
$$\left. + \frac{\sin 2\omega t}{4\pi} + \frac{\cos 3\omega t}{9\pi^2} + \frac{\sin 3\omega t}{6\pi} + \ldots\right)$$

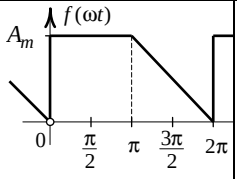


Рис. П32

$$f(\omega t) = \frac{3A_m}{4} - 2A_m\left(\frac{\cos\omega t}{\pi^2} - \frac{\sin\omega t}{2\pi} - \right.$$
$$\left. - \frac{\sin 2\omega t}{4\pi} + \frac{\cos 3\omega t}{9\pi^2} - \frac{\sin 3\omega t}{6\pi} + \ldots\right)$$

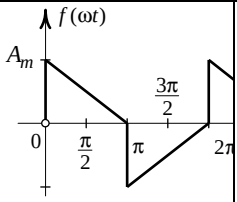


Рис. П33

$$f(\omega t) = 4A_m\left(\frac{\cos\omega t}{\pi^2} + \frac{\sin\omega t}{2\pi} + \frac{\cos 3\omega t}{9\pi^2} + \right.$$
$$\left. + \frac{\sin 3\omega t}{6\pi} + \frac{\cos 5\omega t}{25\pi^2} + \frac{\sin 5\omega t}{10\pi} + \ldots\right)$$

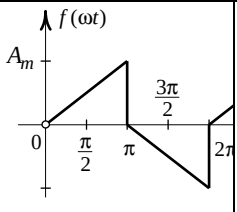


Рис. П34

$$f(\omega t) = 4A_m\left(-\frac{\cos\omega t}{\pi^2} + \frac{\sin\omega t}{2\pi} - \frac{\cos 3\omega t}{9\pi^2} + \right.$$
$$\left. + \frac{\sin 3\omega t}{6\pi} - \frac{\cos 5\omega t}{25\pi^2} + \frac{\sin 5\omega t}{10\pi} + \ldots\right)$$

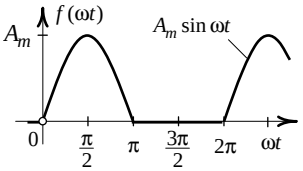


Рис. П35

$$f(\omega t) = \frac{A_m}{\pi} + 2A_m\left(\frac{\sin\omega t}{4} - \frac{\cos 2\omega t}{3\pi} - \right.$$
$$\left. - \frac{\cos 4\omega t}{15\pi} - \frac{\cos 6\omega t}{35\pi} - \frac{\cos 8\omega t}{63\pi} - \ldots\right)$$

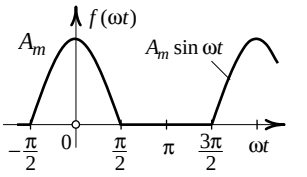


Рис. П36

$$f(\omega t) = \frac{A_m}{\pi} + 2A_m\left(\frac{\cos\omega t}{4} + \frac{\cos 2\omega t}{3\pi} - \right.$$
$$\left. - \frac{\cos 4\omega t}{15\pi} + \frac{\cos 6\omega t}{35\pi} - \frac{\cos 8\omega t}{63\pi} + \ldots\right)$$

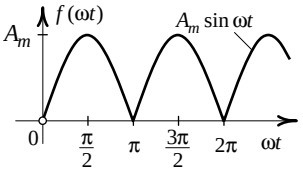


Рис. П37

$$f(\omega t) = \frac{2A_m}{\pi} - \frac{4A_m}{\pi}\left(\frac{\cos 2\omega t}{3} + \frac{\cos 4\omega t}{15} + \right.$$
$$\left. + \frac{\cos 6\omega t}{35} + \frac{\cos 8\omega t}{63} + \frac{\cos 10\omega t}{99} + \ldots\right)$$

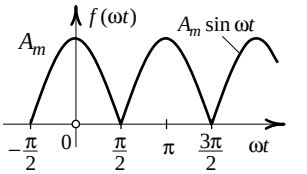


Рис. П38

$$f(\omega t) = \frac{2A_m}{\pi} + \frac{4A_m}{\pi}\left(\frac{\cos 2\omega t}{3} - \frac{\cos 4\omega t}{15} + \right.$$
$$\left. + \frac{\cos 6\omega t}{35} - \frac{\cos 8\omega t}{63} + \frac{\cos 10\omega t}{99} - \ldots\right)$$

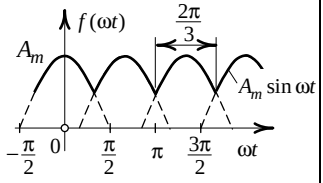


Рис. П39

$$f(\omega t) = \frac{3\sqrt{3}A_m}{2\pi} + \frac{3\sqrt{3}A_m}{\pi}\left(\frac{\cos 3\omega t}{8} - \frac{\cos 6\omega t}{35} - \right.$$
$$\left. + \frac{\cos 9\omega t}{80} - \frac{\cos 12\omega t}{143} + \frac{\cos 15\omega t}{224} + \ldots\right)$$