# Функции y=sinx

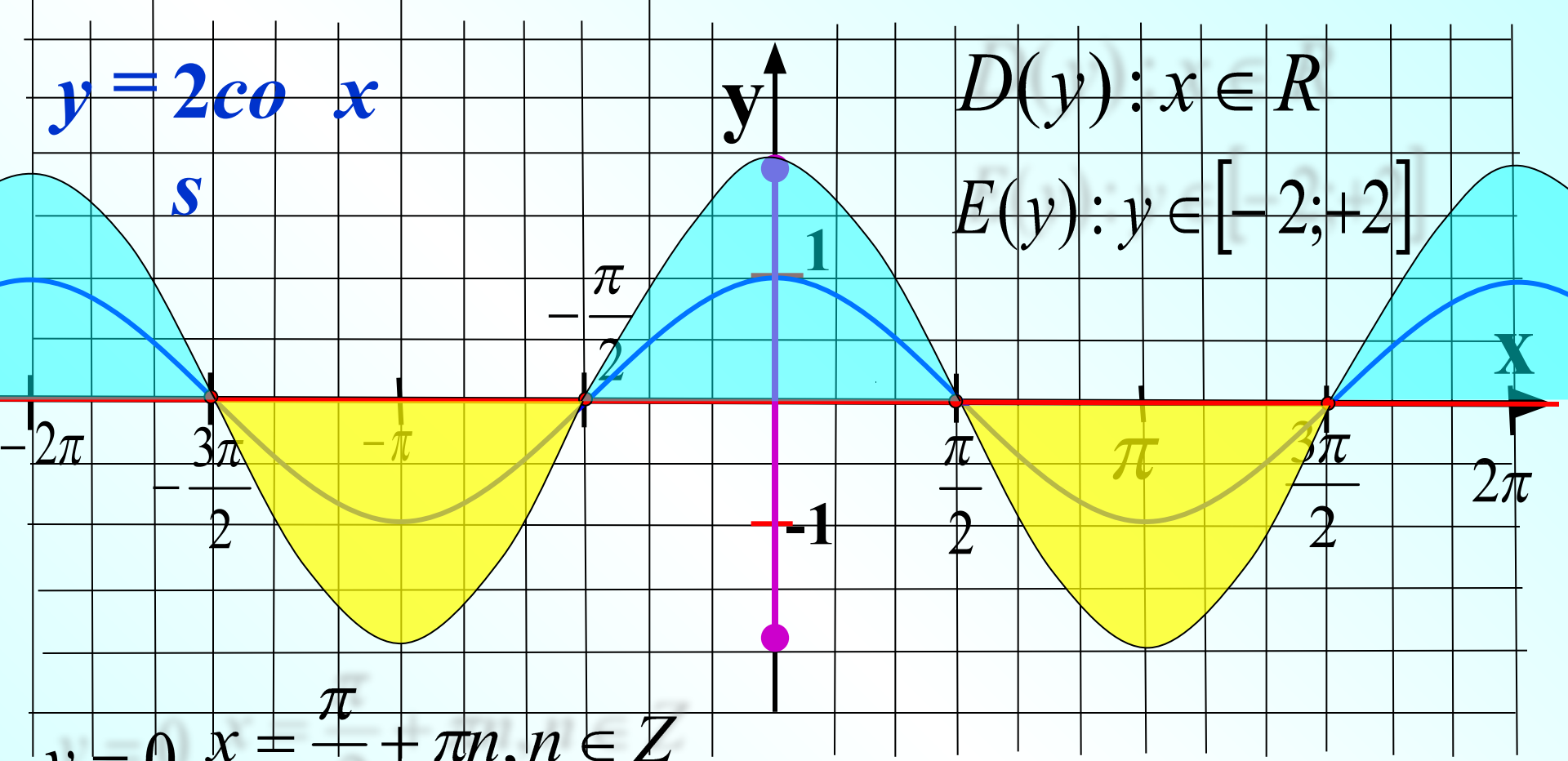
# y=cosx.

## Свойства.

## Преобразование графиков.

$y=mf(x)$

$y=f(kx)$



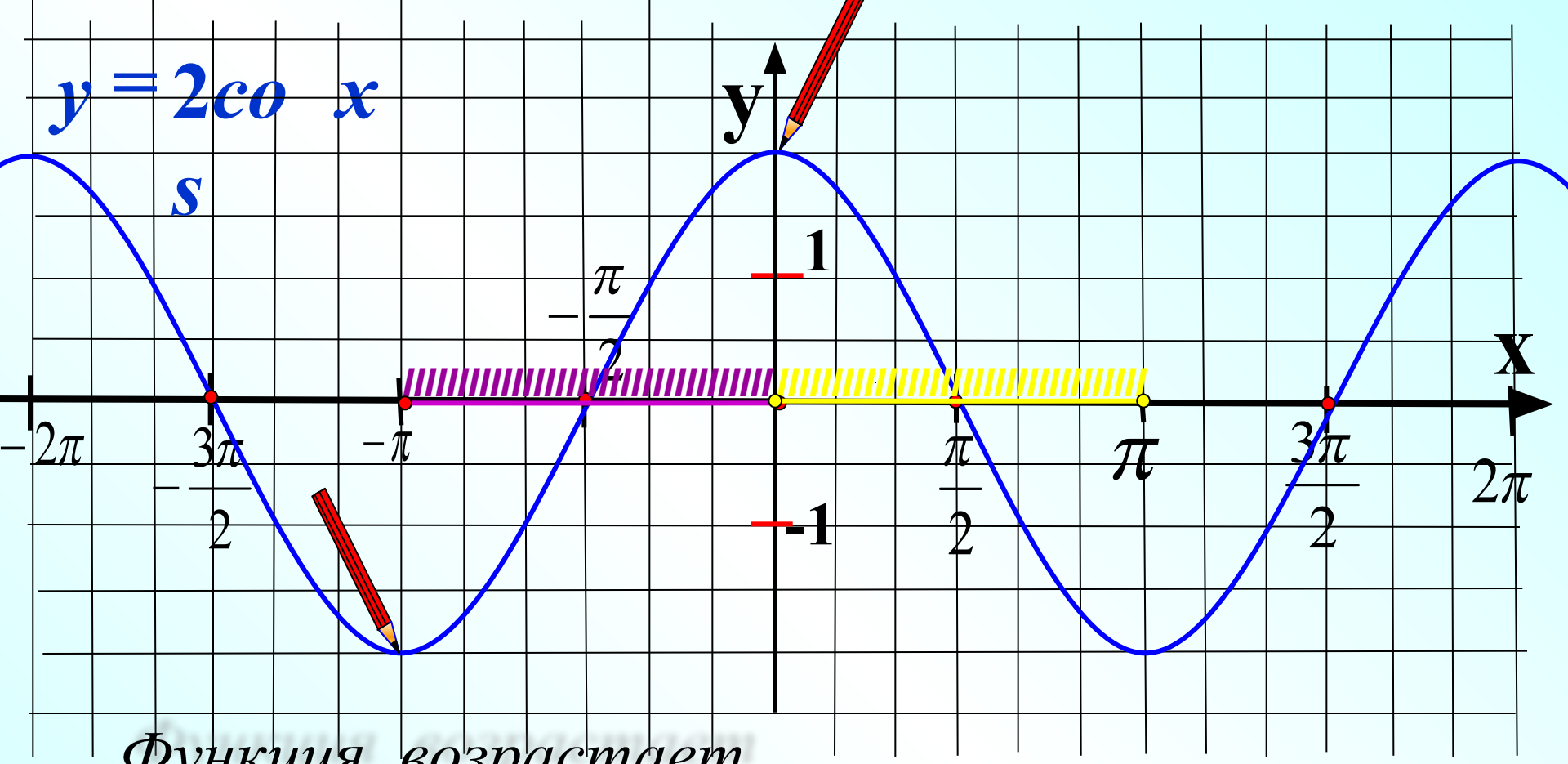

$D(y): x \in R$

$E(y): y \in [-2;+2]$

$y = 0 \quad x = \frac{\pi}{2} + \pi n, n \in Z$

$y > 0 \quad x \in \left(-\frac{\pi}{2} + 2\pi n; \frac{\pi}{2} + 2\pi n\right)$

$y < 0 \quad x \in \left(\frac{\pi}{2} + 2\pi n; \frac{3\pi}{2} + 2\pi n\right)$

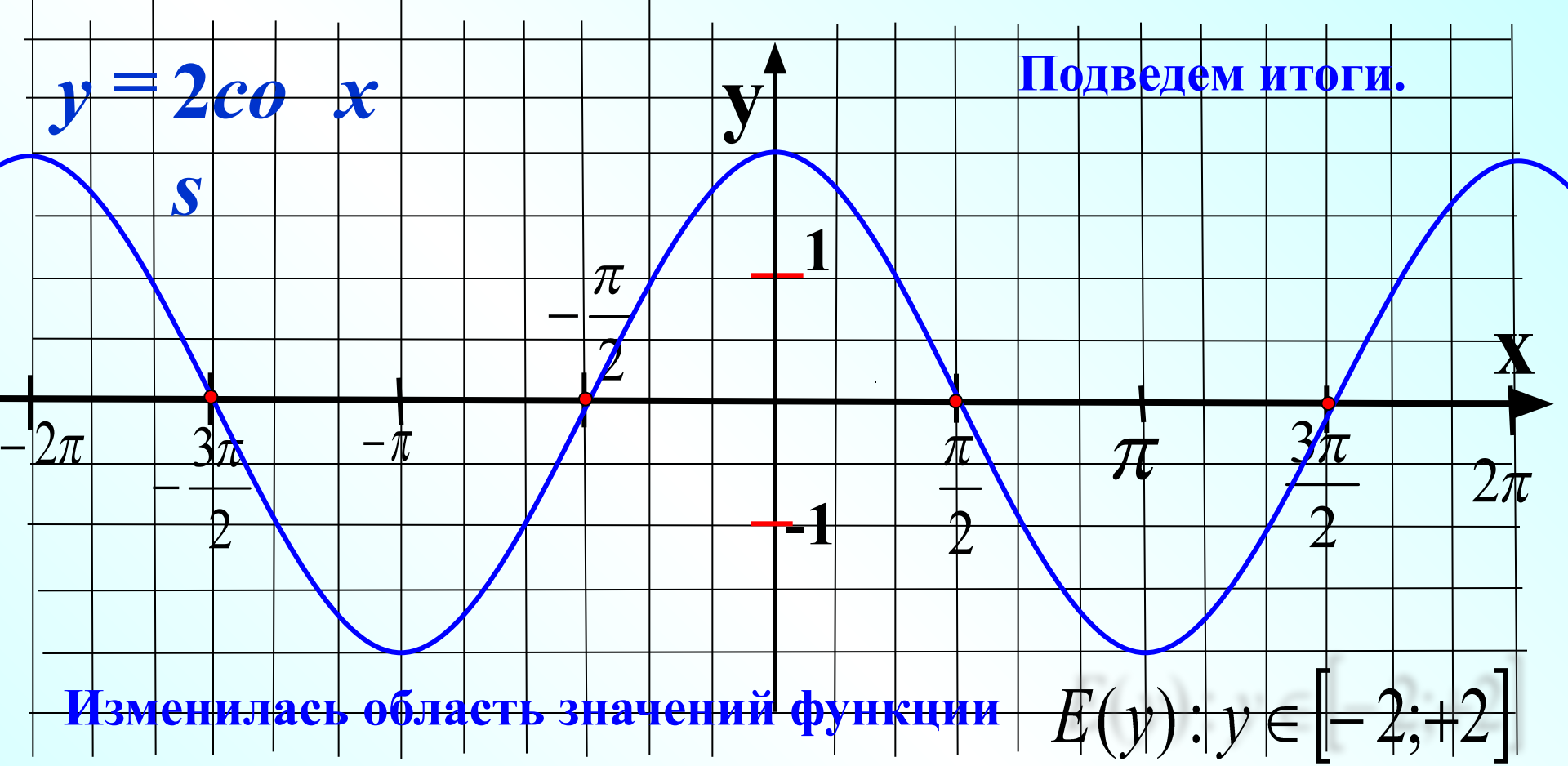



*Функция возрастает*

$$x \in [-\pi + 2\pi n;\ 2\pi n]$$

*Функция убывает*

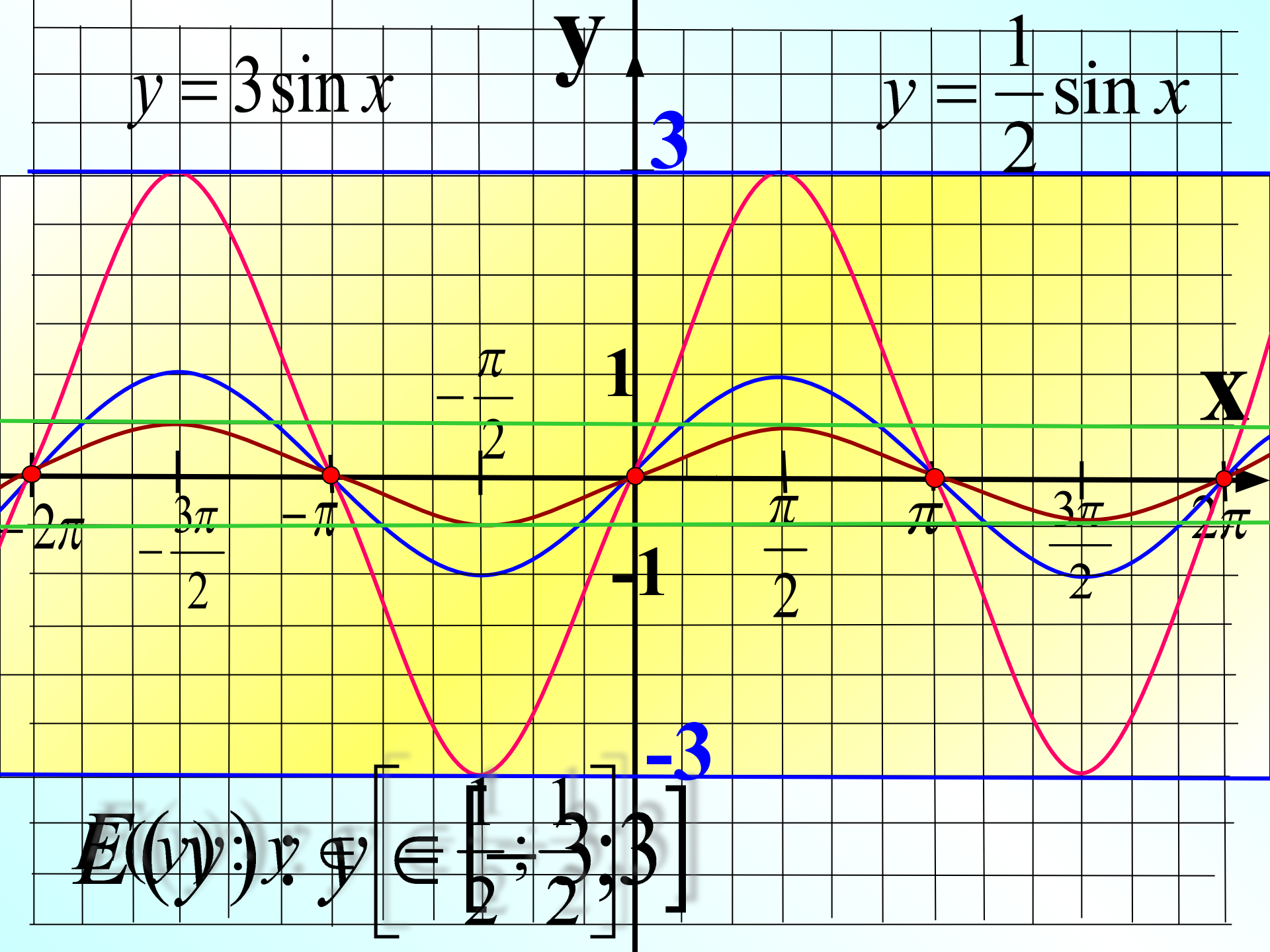
$$x \in [2\pi n;\ \pi + 2\pi n]$$

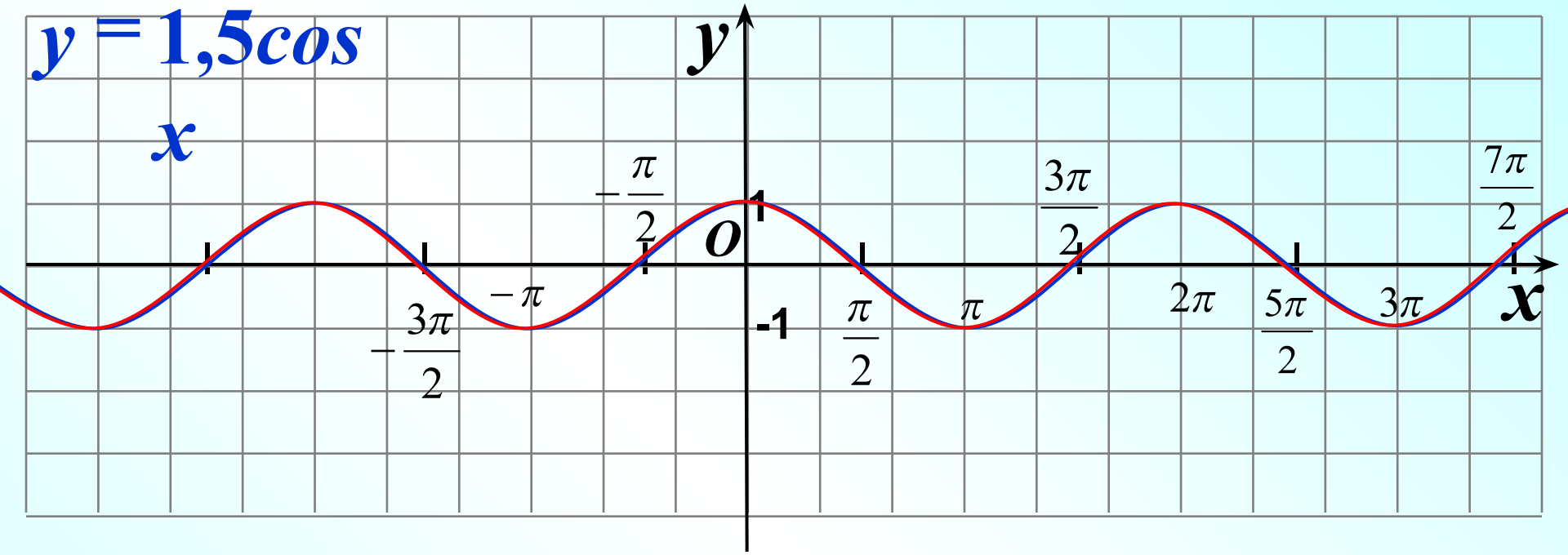



**Наибольшее и наименьшее значения функции**

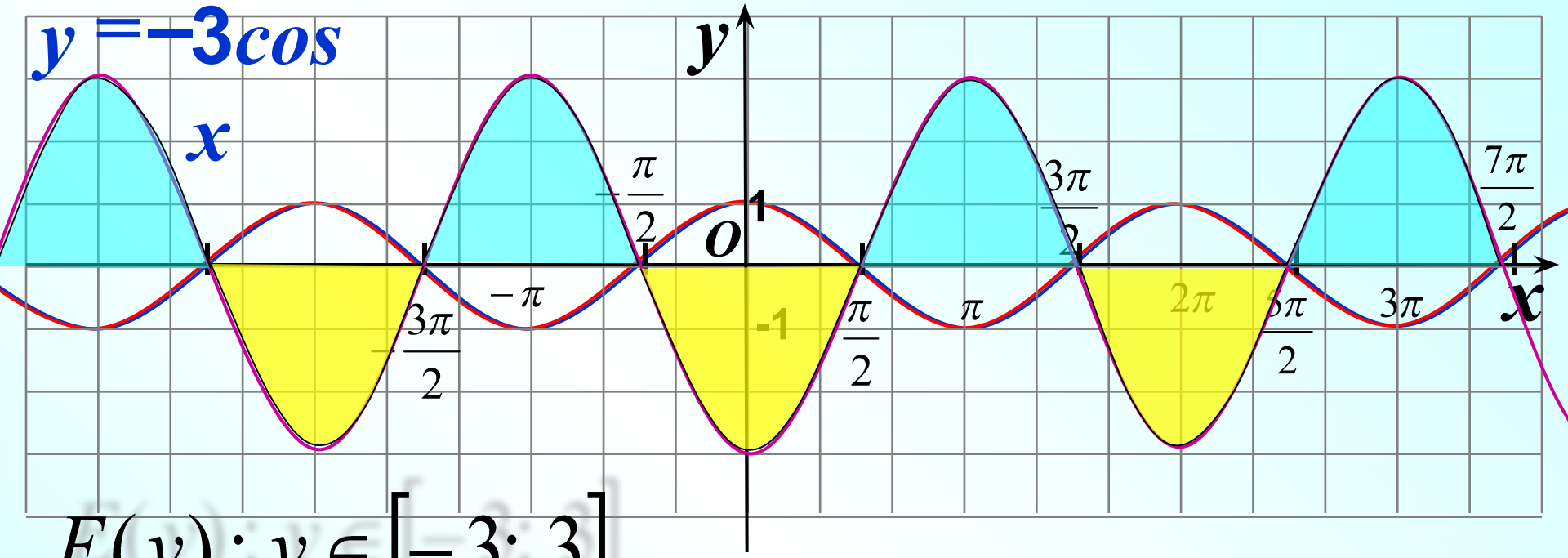
$$y = 2 \qquad x = 2\pi n,\ n \in Z$$

$$y = -2 \qquad x = \pi + 2\pi n,\ n \in Z$$


$y = 3\sin x$
$y = \frac{1}{2}\sin x$
y
x
3
1
-1
-3
$-2\pi$
$-\frac{3\pi}{2}$
$-\pi$
$-\frac{\pi}{2}$
$\frac{\pi}{2}$
$\pi$
$\frac{3\pi}{2}$
$2\pi$
$E(y): y \in [-3; -\frac{1}{2}; \frac{1}{2}; 3]$


y = 1,5cos
x
y
x
O
1
-1
$-\frac{\pi}{2}$
$\frac{3\pi}{2}$
$\frac{7\pi}{2}$
$-\pi$
$-\frac{3\pi}{2}$
$\frac{\pi}{2}$
$\pi$
$2\pi$
$\frac{5\pi}{2}$
$3\pi$

$$E(y): y \in [-1{,}5;\ 1{,}5]$$

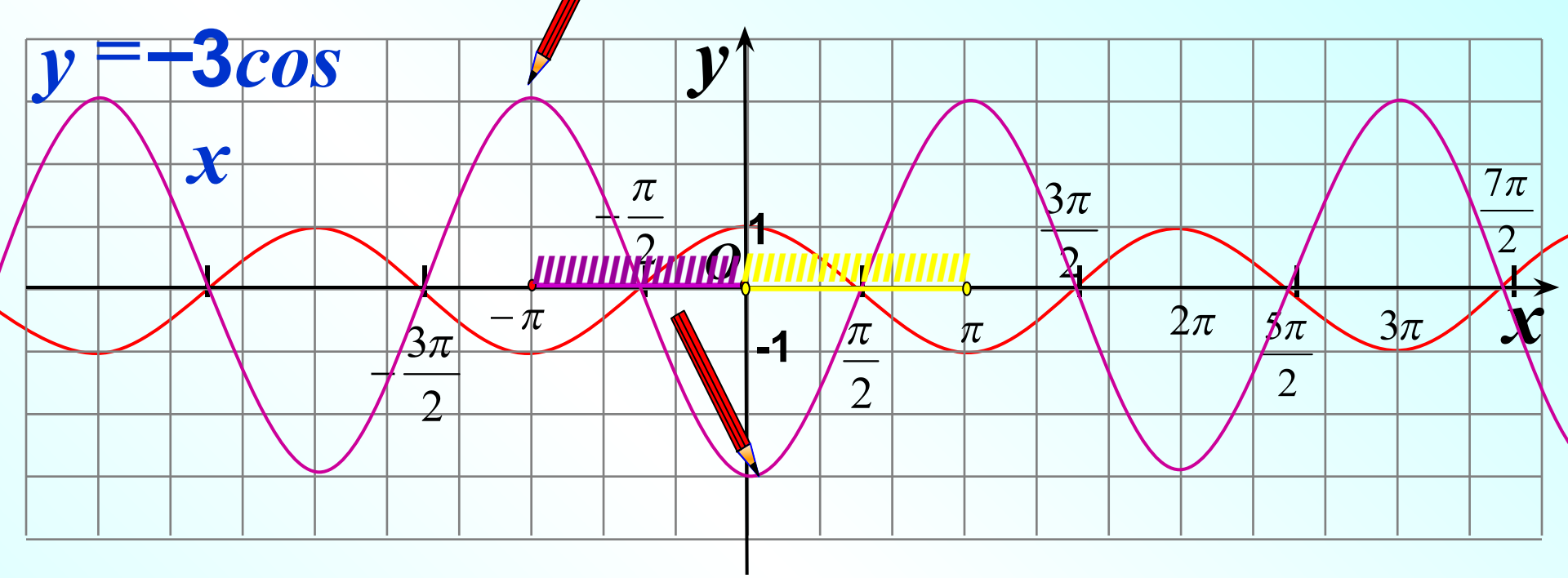



$$E(y): y \in [-3; 3]$$

$$y > 0 \quad x \in \left(\frac{\pi}{2} + 2\pi n; \frac{3\pi}{2} + 2\pi n\right)$$

$$y < 0 \quad x \in \left(-\frac{\pi}{2} + 2\pi n; \frac{\pi}{2} + 2\pi n\right)$$

Какие свойства еще изменились?



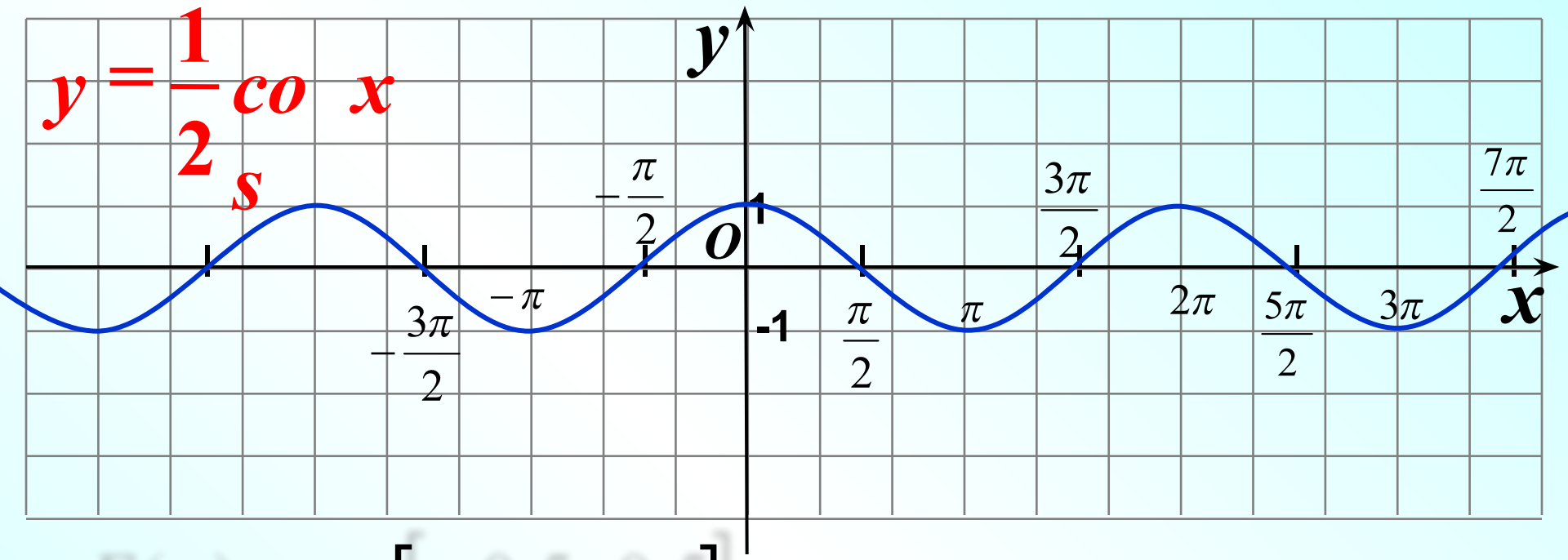

*Функция убывает*

$$x \in [-\pi + 2\pi n;\ 2\pi n]$$

*Функция возрастает*

$$x \in [2\pi n;\ \pi + 2\pi n]$$

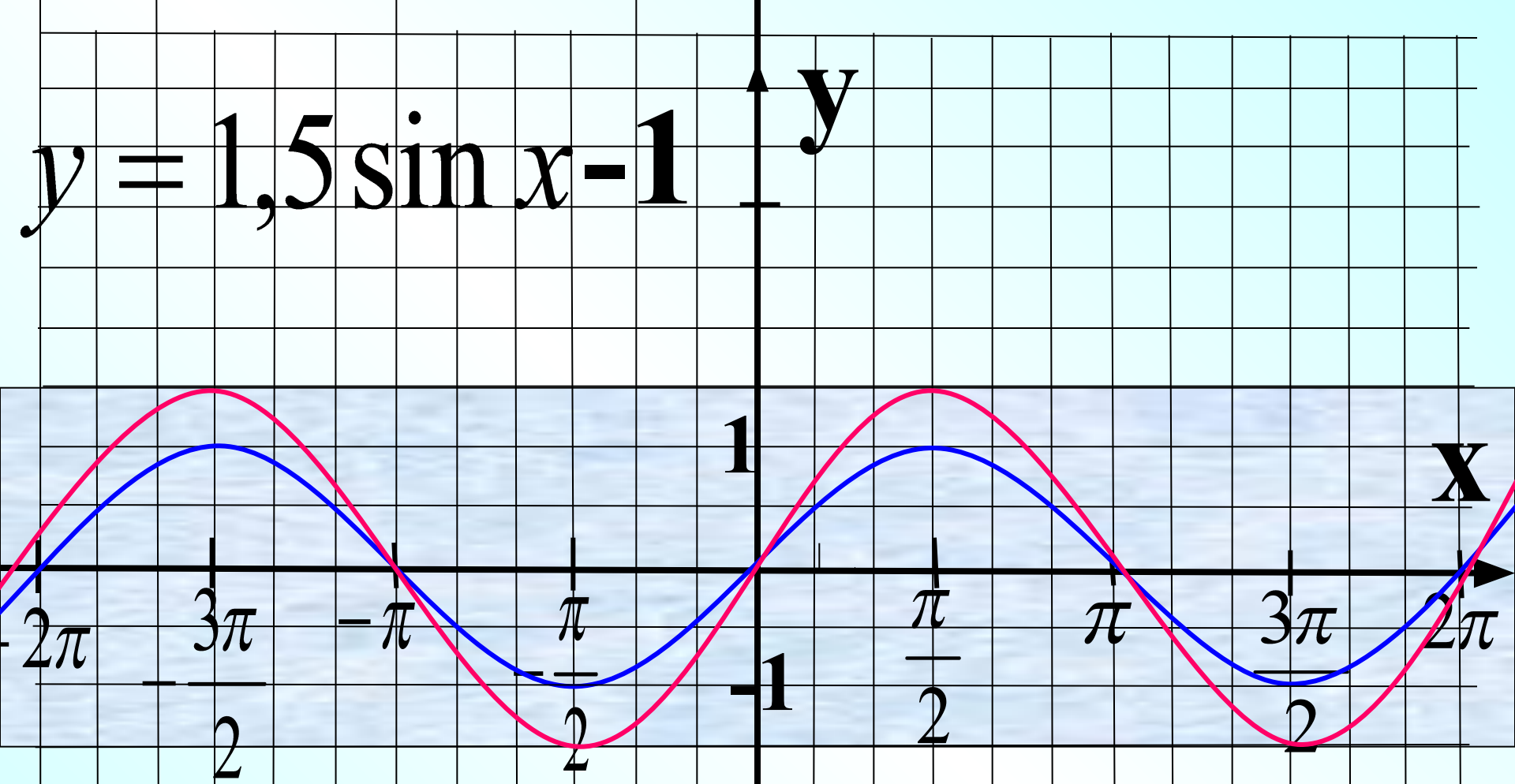
Какие свойства еще изменились?




$$E(y): y \in [-0{,}5;\ 0{,}5]$$

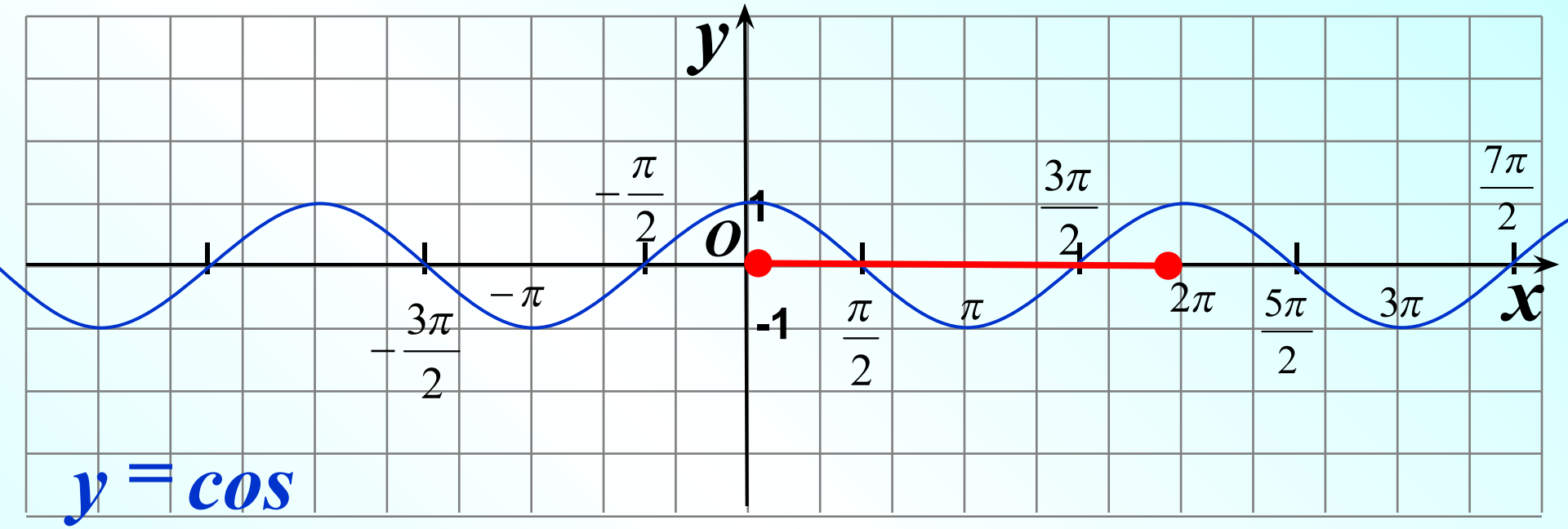
Какие свойства еще изменились?

$y = 1{,}5\sin x - 1$




$E(y): y \in [-2{,}5;0{,}5]$

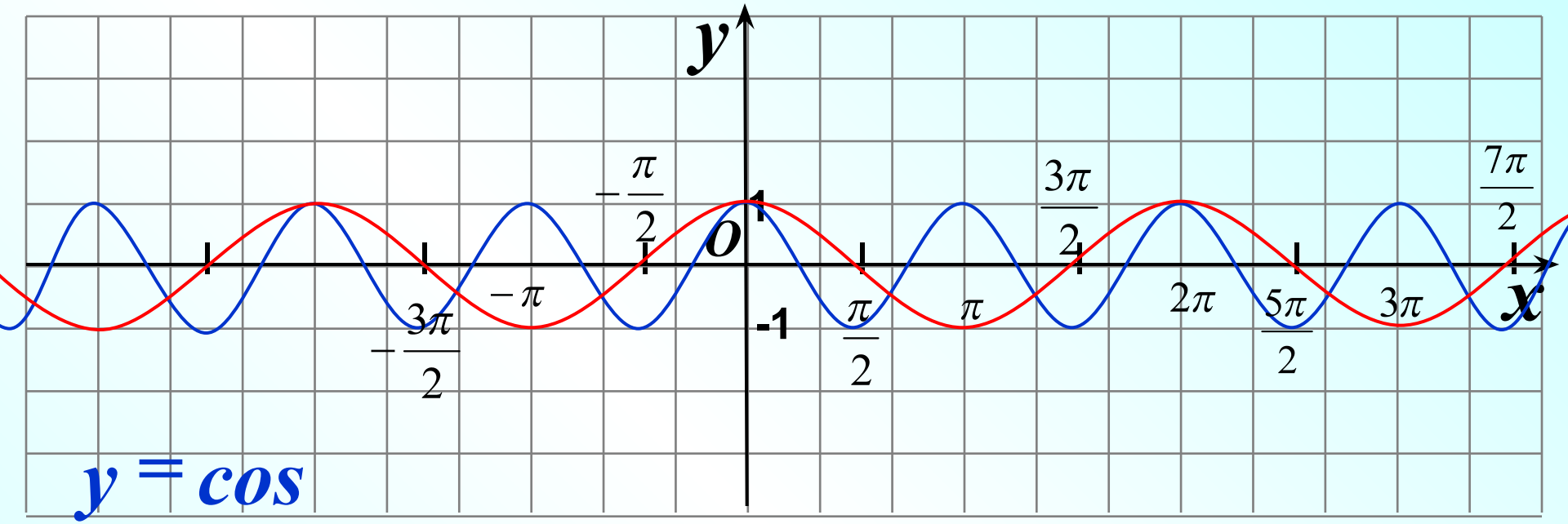
Какие свойства еще изменились?


y
x
O
1
-1
$-\frac{\pi}{2}$
$\frac{3\pi}{2}$
$\frac{7\pi}{2}$
$-\pi$
$-\frac{3\pi}{2}$
$\frac{\pi}{2}$
$\pi$
$2\pi$
$\frac{5\pi}{2}$
$3\pi$

$y = cos$

$2x$

$$T = \pi$$




$y = \cos 2x$

$T = \pi$

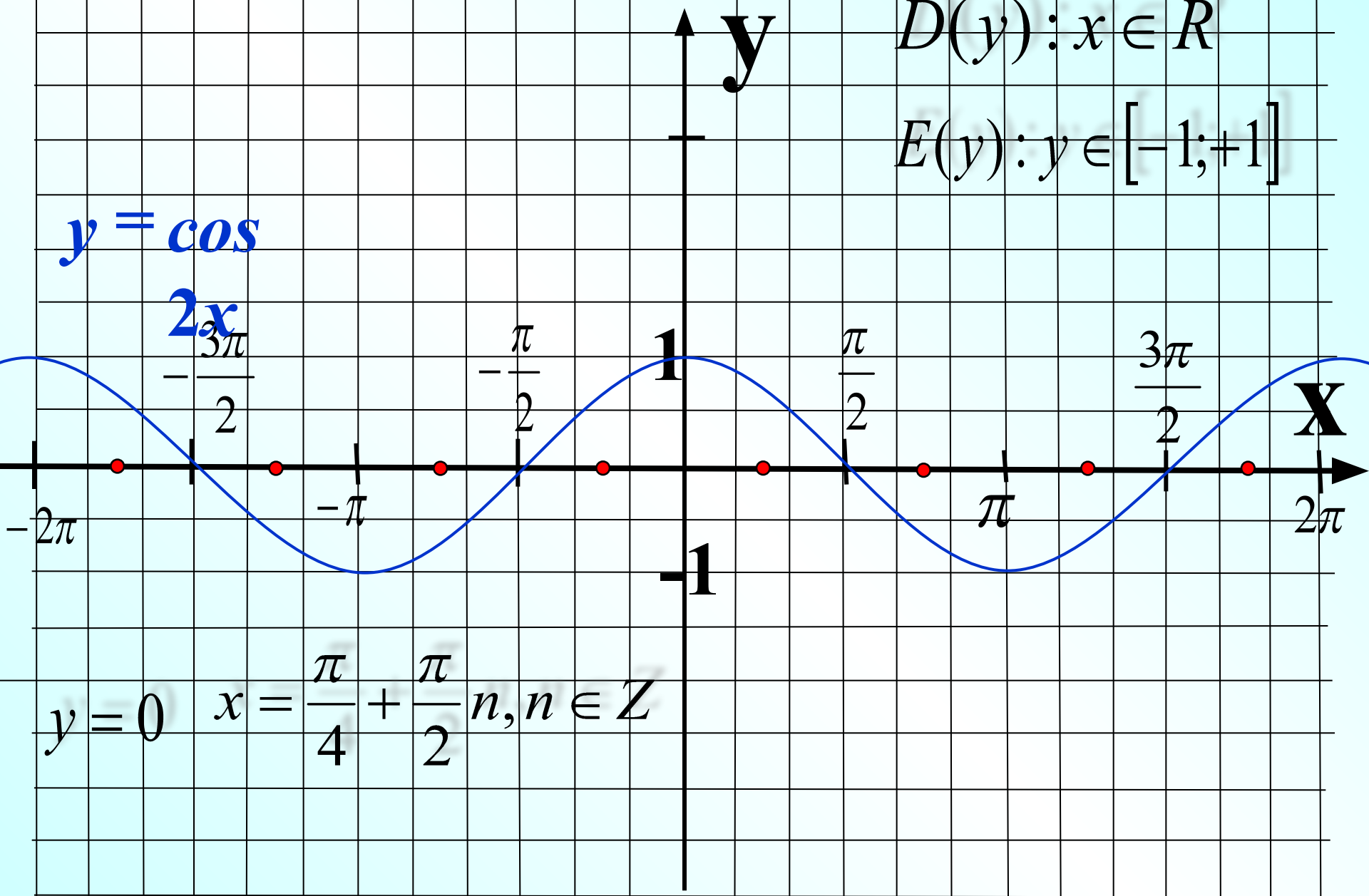
Какие свойства изменились в сравнении с функцией ***y=cos x***?

Рассмотрим систему координат с единичным отрезком 1 см

$D(y): x \in R$

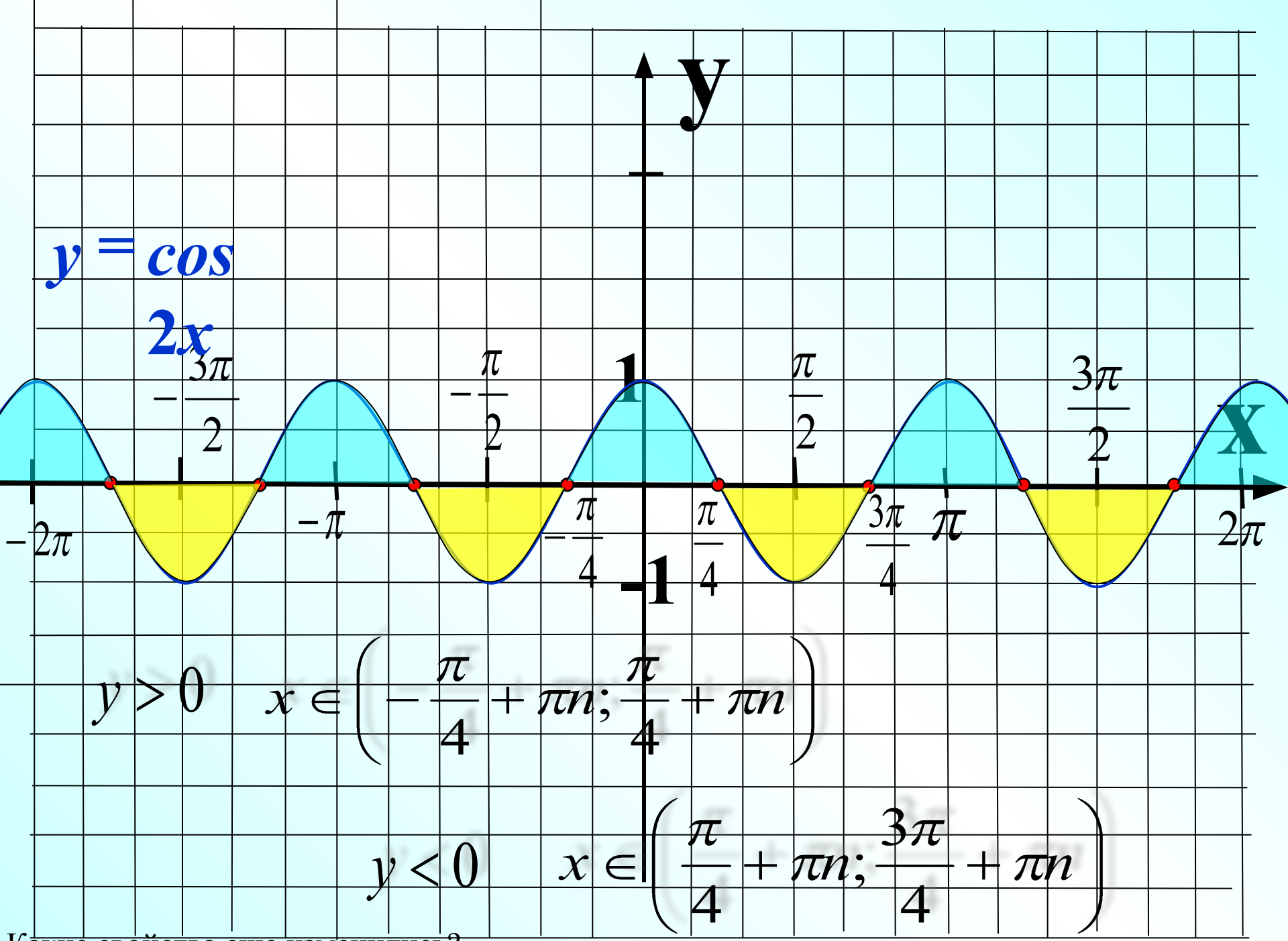
$E(y): y \in [-1;+1]$

$y = \cos 2x$

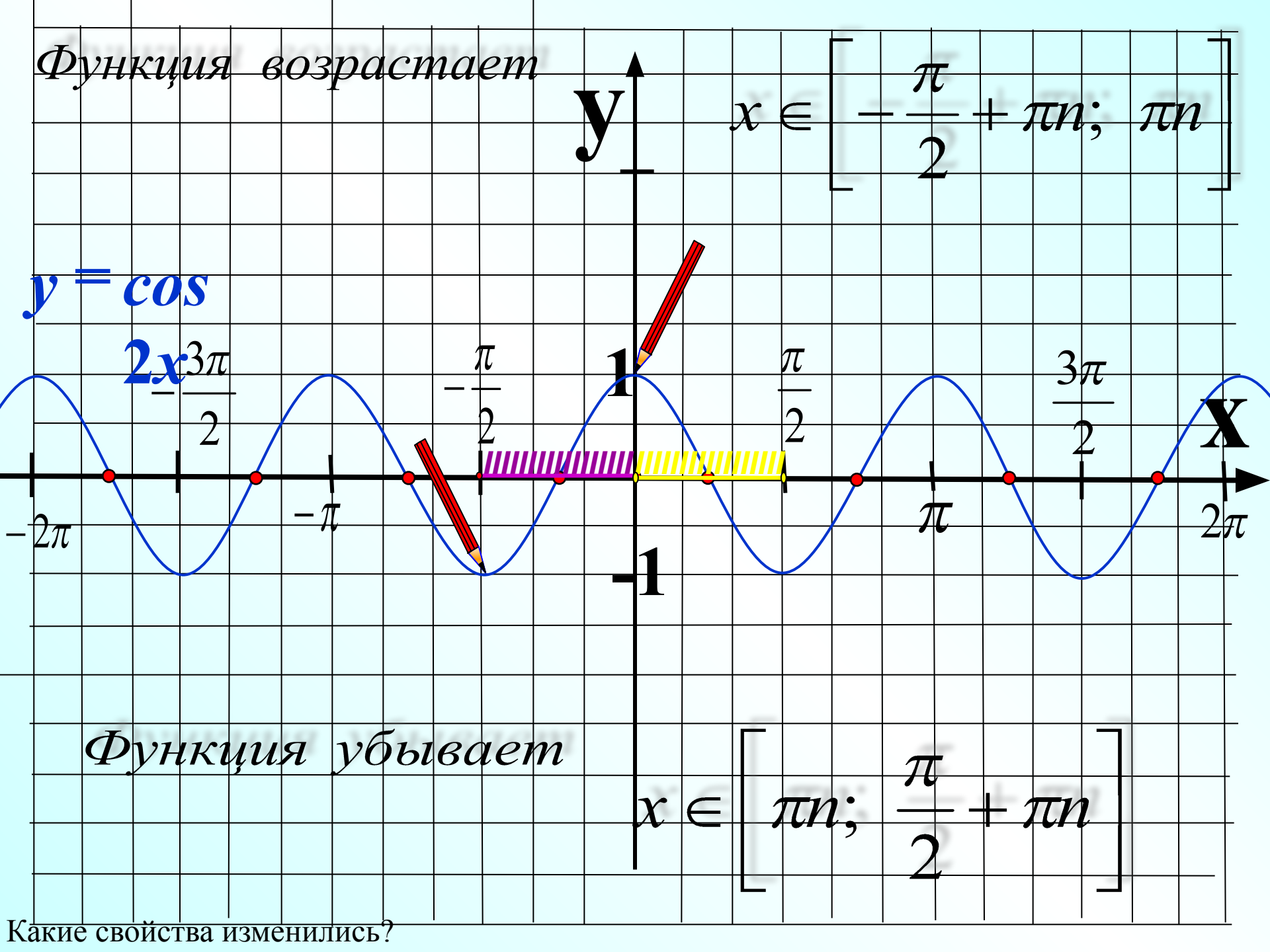



$y = 0$ $x = \frac{\pi}{4} + \frac{\pi}{2}n, n \in Z$

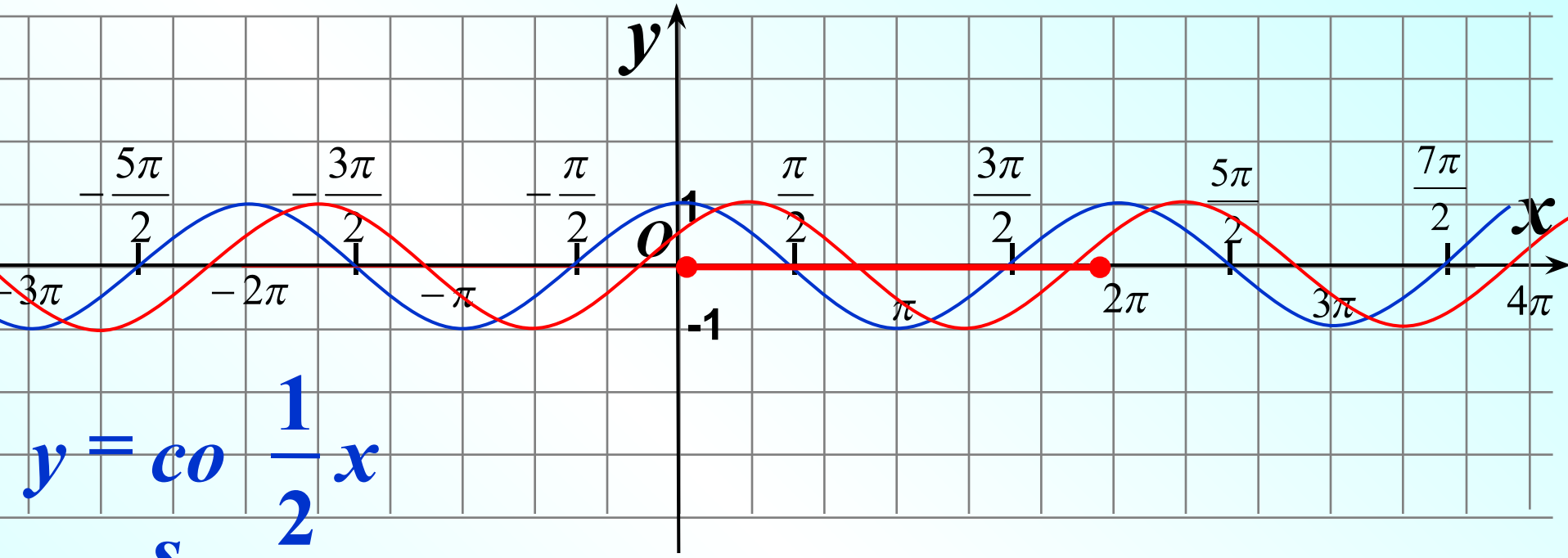
Какие свойства еще изменились?




Какие свойства еще изменились?



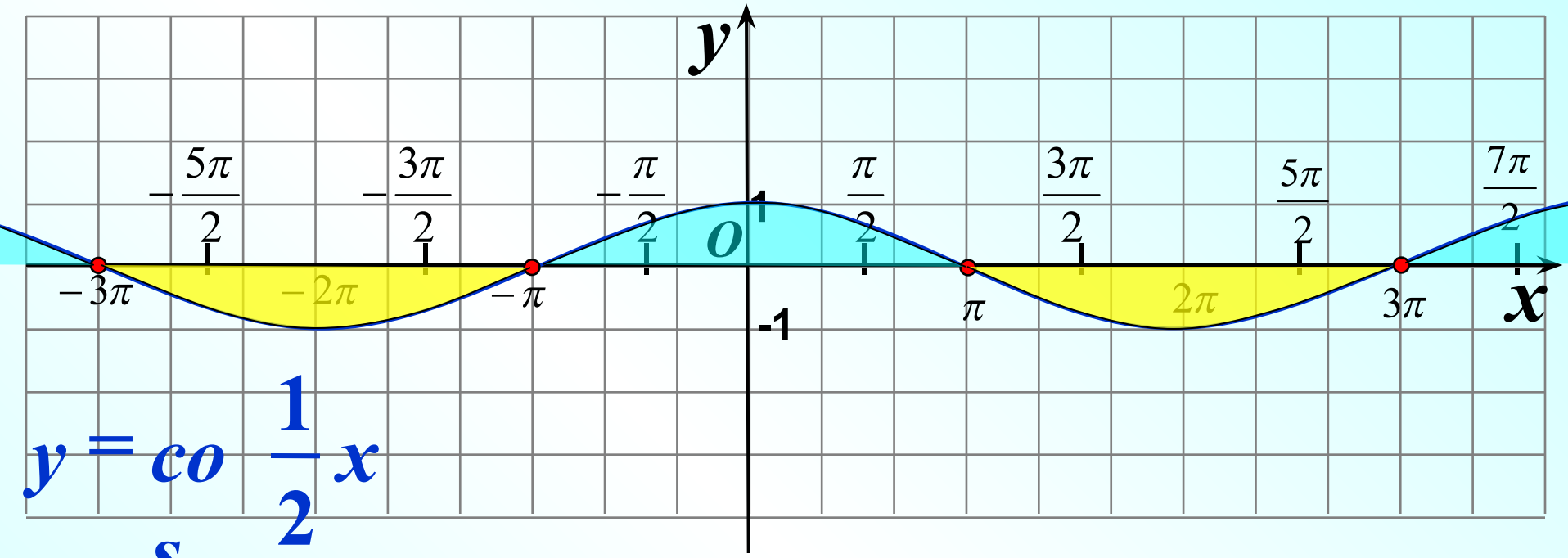

Какие свойства изменились?




$$y = \cos\frac{1}{2}x$$

$$T = 4\pi$$

Какие свойства изменились?



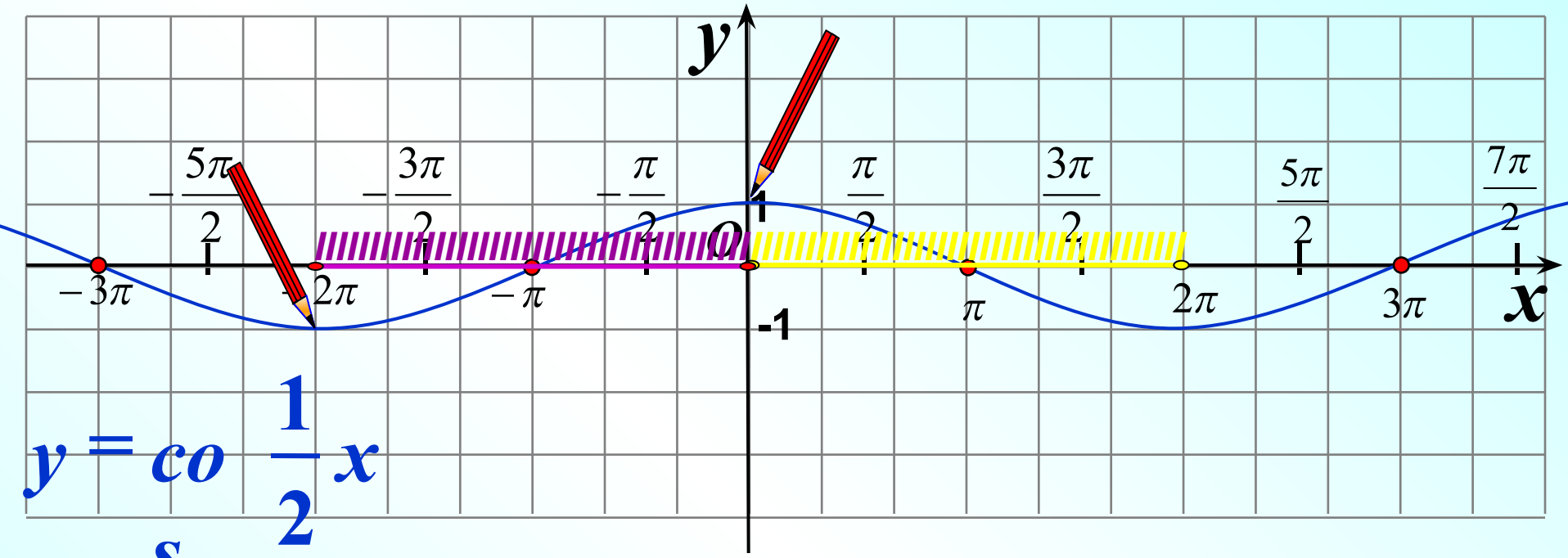

$y = \cos\frac{1}{2}x$

$y = 0 \quad x = \pi + 2\pi n, n \in Z$

$y > 0 \quad x \in (-\pi + 4\pi n; \pi + 4\pi n)$

$y < 0 \quad x \in (\pi + 4\pi n; 3\pi + 4\pi n)$

Какие свойства изменились?




$y = \cos\frac{1}{2}x$

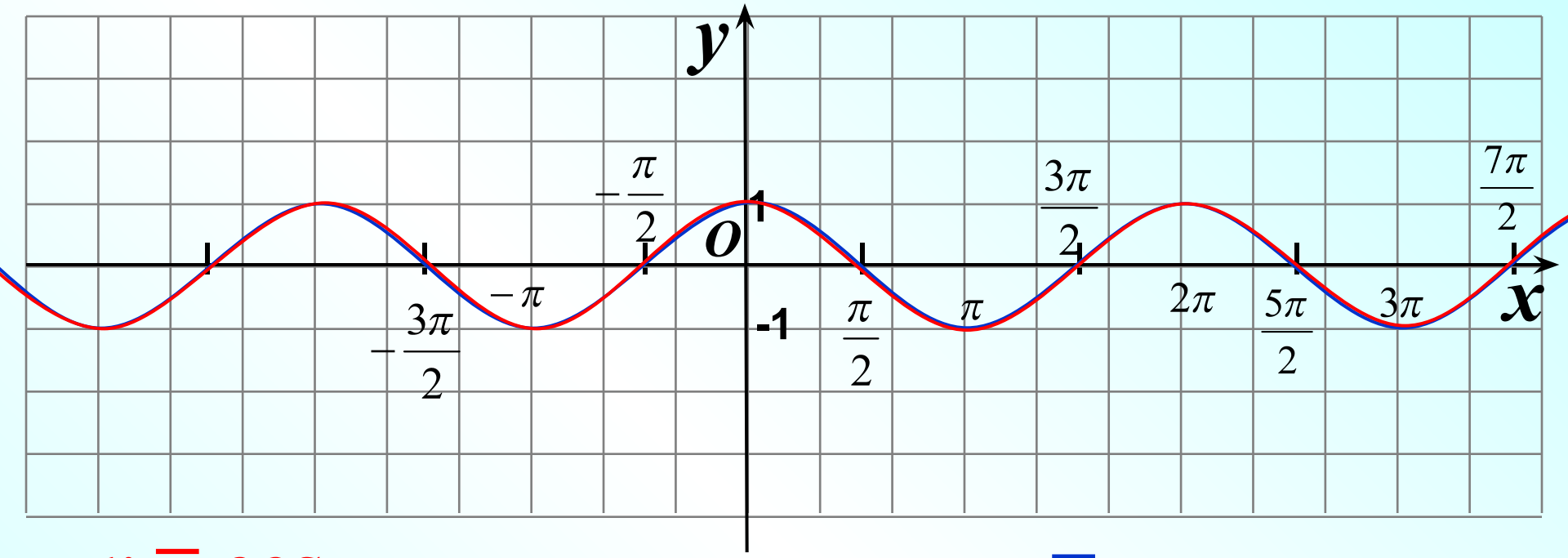
*Функция возрастает*

$$x \in [-2\pi + 4\pi n;\ 4\pi n]$$

*Функция убывает*

$$x \in [4\pi n;\ 2\pi + 4\pi n]$$

Какие свойства изменились?

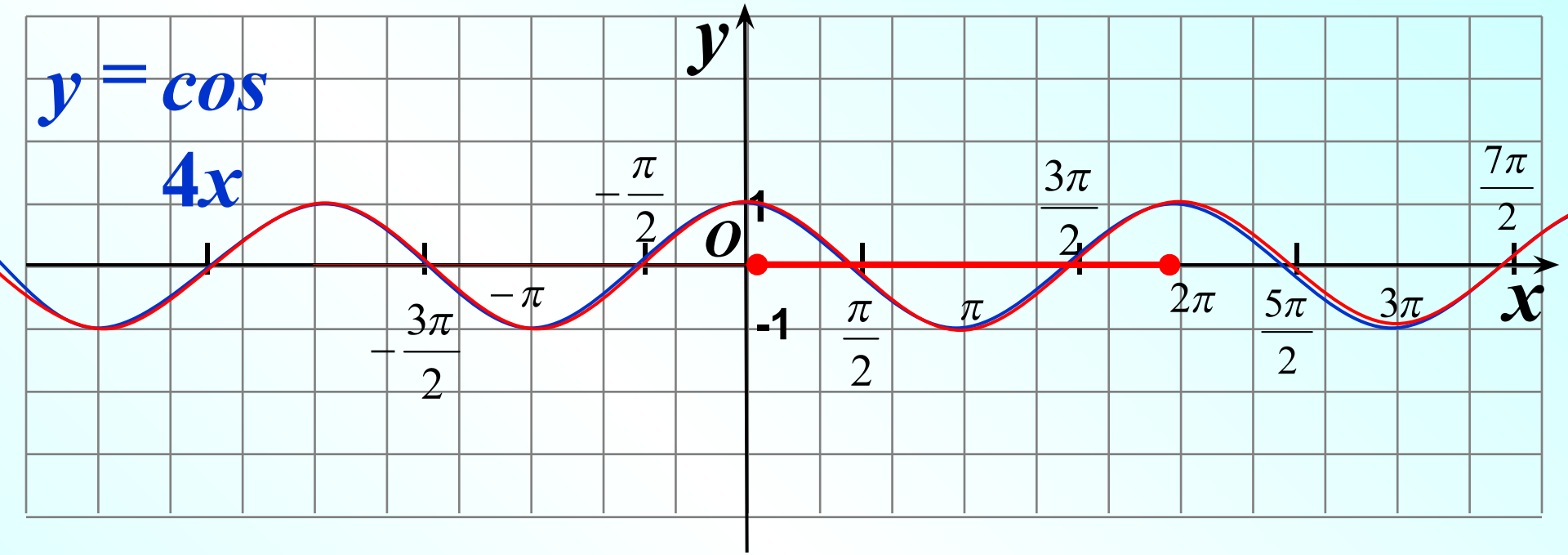



$y = \cos x$

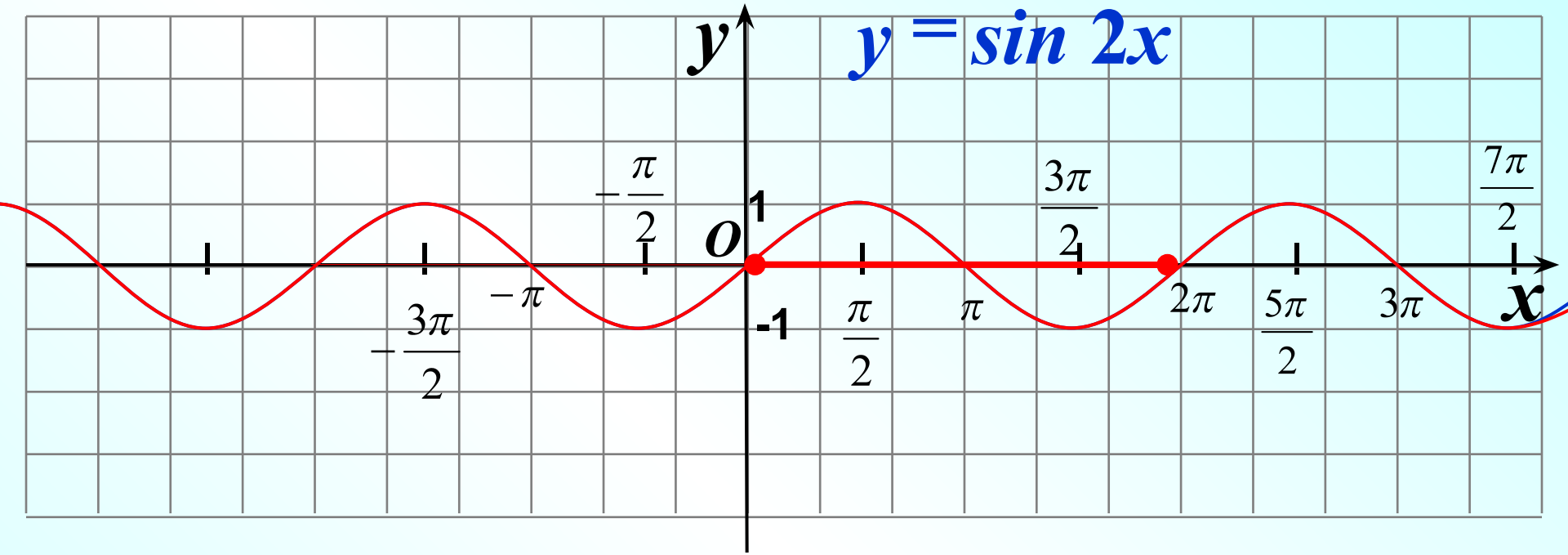
$T = 2\pi$

$y = \cos 2x$

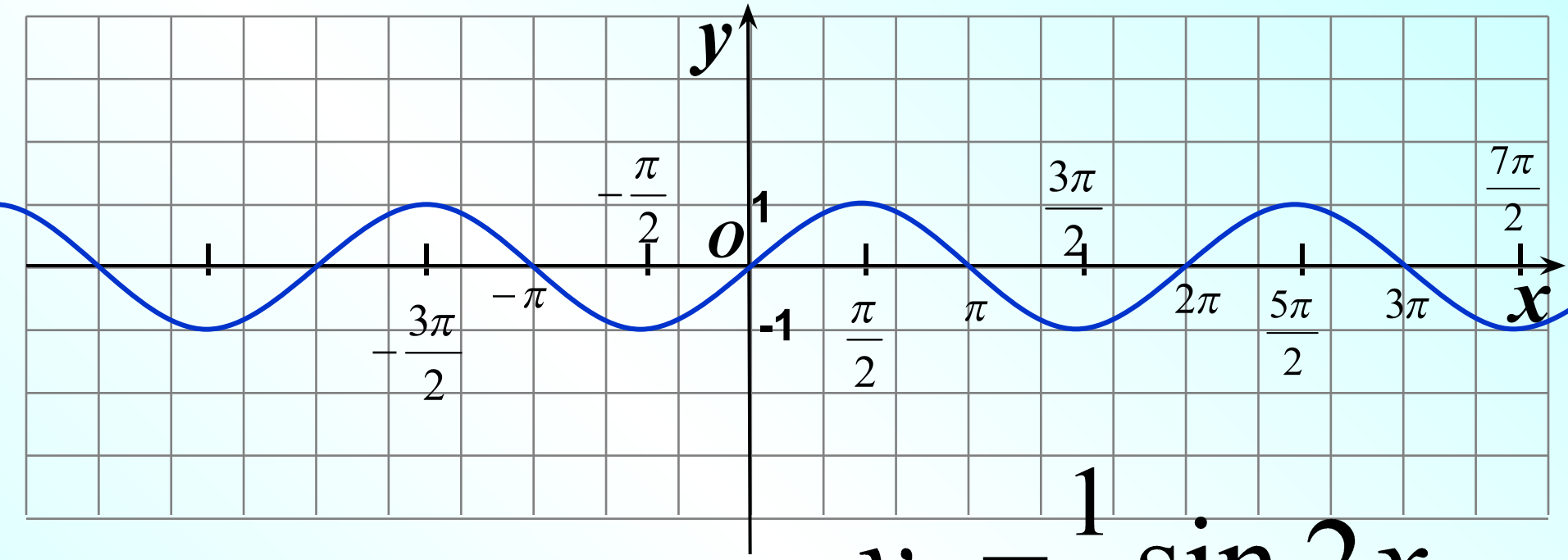
$T = \pi$


y = cos 4x
y
x
O
1
-1
$-\frac{\pi}{2}$
$\frac{3\pi}{2}$
$\frac{7\pi}{2}$
$-\frac{3\pi}{2}$
$-\pi$
$\frac{\pi}{2}$
$\pi$
$2\pi$
$\frac{5\pi}{2}$
$3\pi$

$$T = \frac{\pi}{2}$$

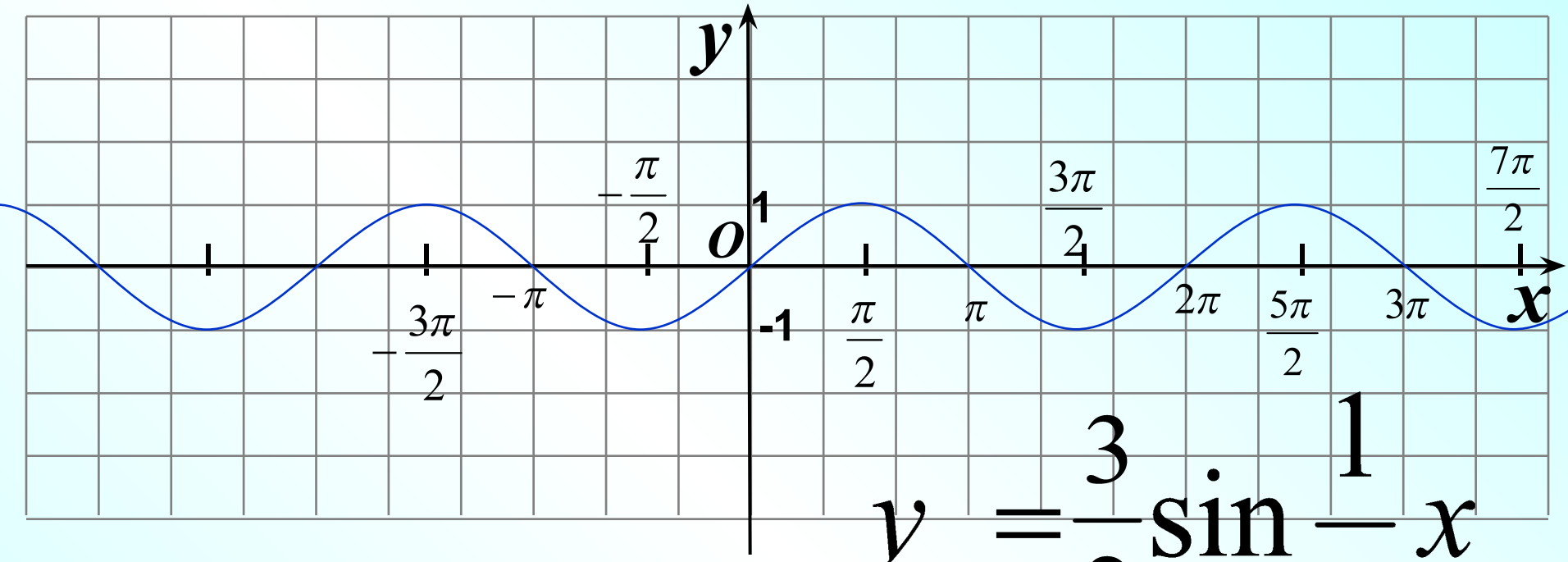

y
y = sin 2x
o
1
-1
x
$-\frac{\pi}{2}$
$\frac{3\pi}{2}$
$\frac{7\pi}{2}$
$-\frac{3\pi}{2}$
$-\pi$
$\frac{\pi}{2}$
$\pi$
$2\pi$
$\frac{5\pi}{2}$
$3\pi$

$$T = \pi$$




$$y = \frac{1}{2}\sin 2x$$

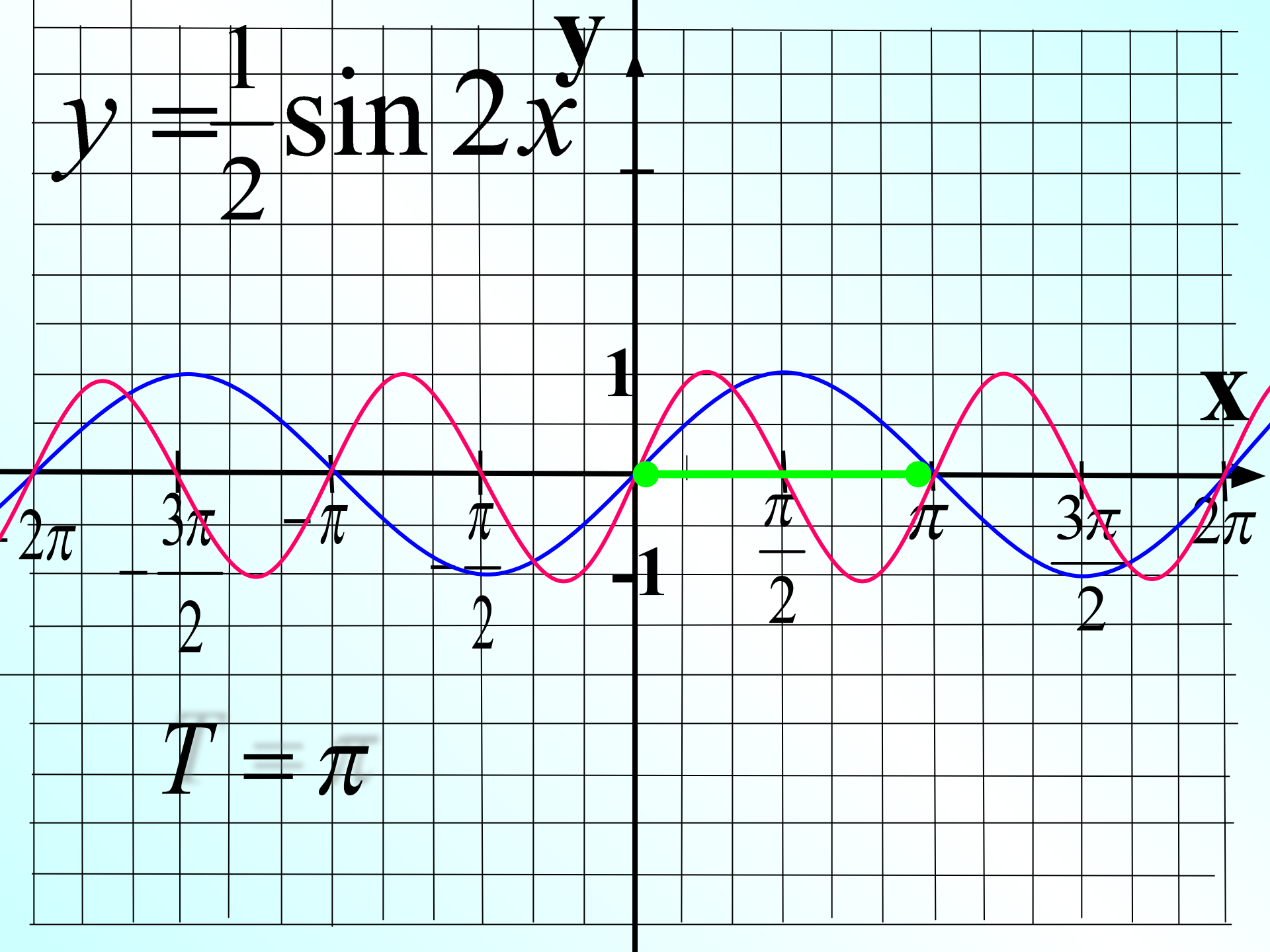
$$T = \pi$$



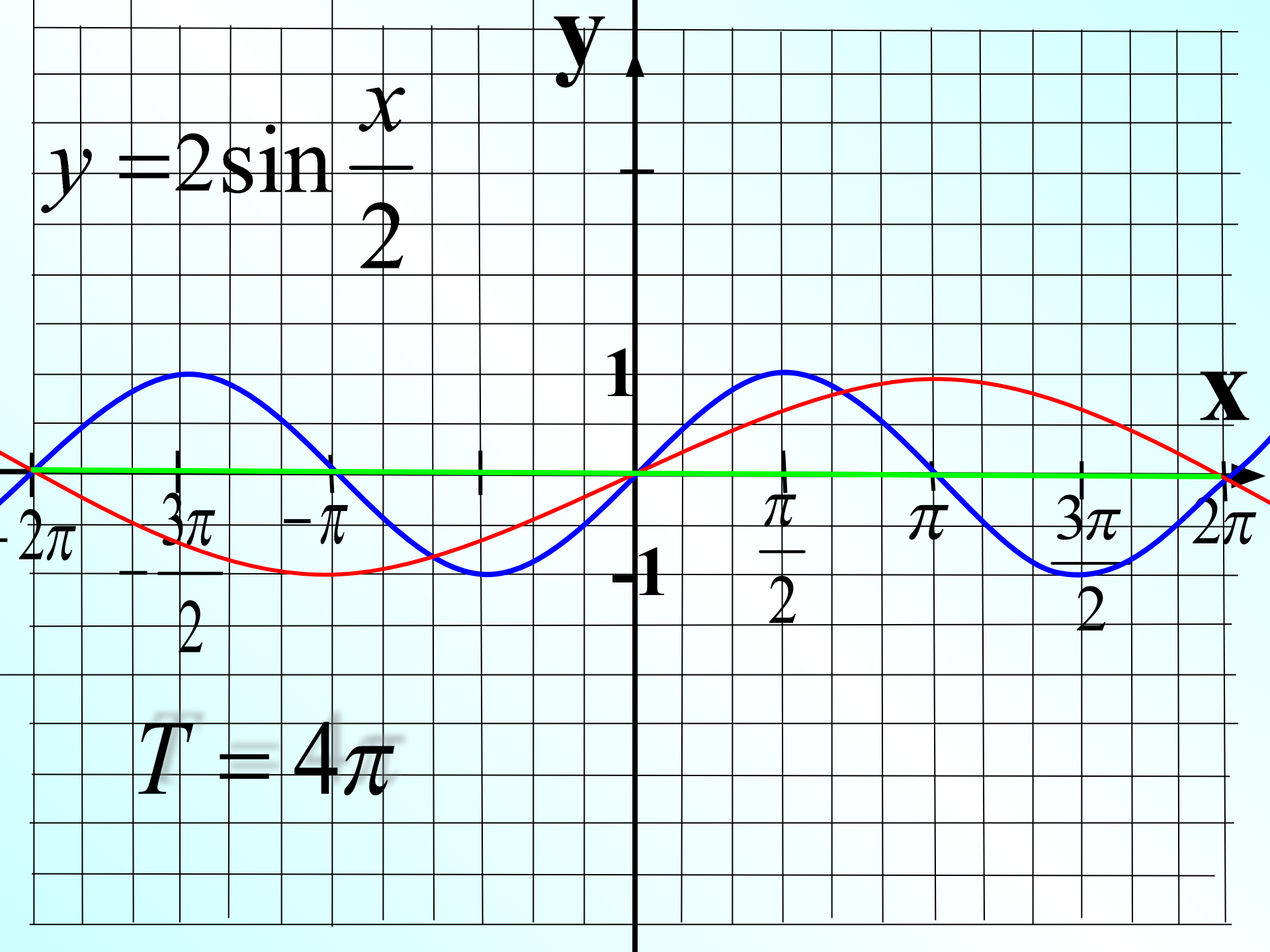

$$y = \frac{3}{2}\sin\frac{1}{2}x$$

$$T = 4\pi$$

$$y = \frac{1}{2}\sin 2x$$




$$T = \pi$$


$y = 2\sin\frac{x}{2}$
y
x
1
-1
$-2\pi$
$-\frac{3\pi}{2}$
$-\pi$
$\frac{\pi}{2}$
$\pi$
$\frac{3\pi}{2}$
$2\pi$
$T = 4\pi$