

Answer on Question #80063 – Math – Algebra

Question

What is the is the period of the function $y(x) = \cos(x^2)$.

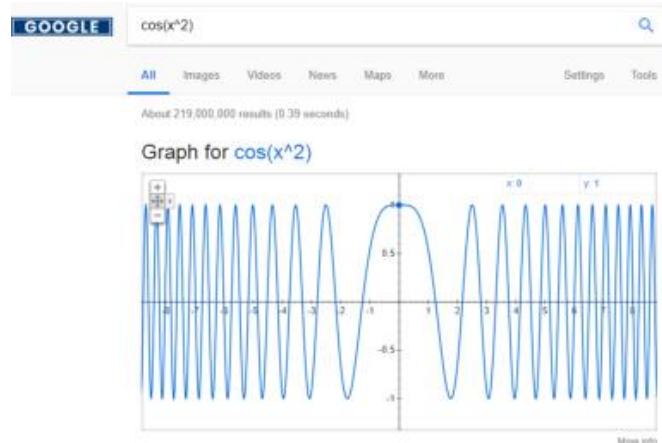
Solution

A function $f: \mathbb{R} \rightarrow \mathbb{R}$ is called periodic if there exists a positive real number T , i. e. the period, such that

$$f(x + T) = f(x) \text{ for all } x \in \mathbb{R}.$$

Some functions are periodic, e. g. all basic trigonometric functions. Some function are not periodic, e. g. polynomials of non-zero degree.

This function is not a basic trigonometric function, and there is no identity which “simplifies” it. Also, it is not a periodic one:



Assume that there exists $T > 0$ such that

$$y(x + T) = y(x) \text{ for all } x.$$

Because $\cos a$ is a 2π - periodic function, we see that

$$x^2 + T + 2\pi = x.$$

But this identity doesn't hold for all x since the polynomial $x^2 + T + 2\pi - x$ has degree 2 and at most two roots. It means that by the definition, the function $y(x) = \cos(x^2)$ is not periodic.

Answer:

The function is not periodic.