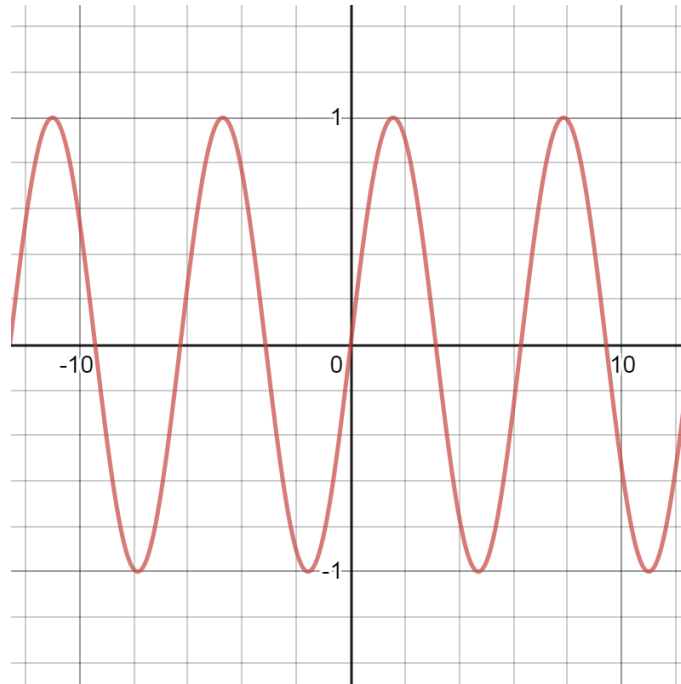


Graphs of Sine and Cosine

In section 9.4 we derived the graph for the function, $f(\theta) = \sin(\theta)$:

$$f(\theta) = \sin(\theta)$$



Note that the horizontal scale of this graph has been chosen as:

$$-12.56 < \theta < 12.56$$

This is because $12.56 \cong 4\pi$.

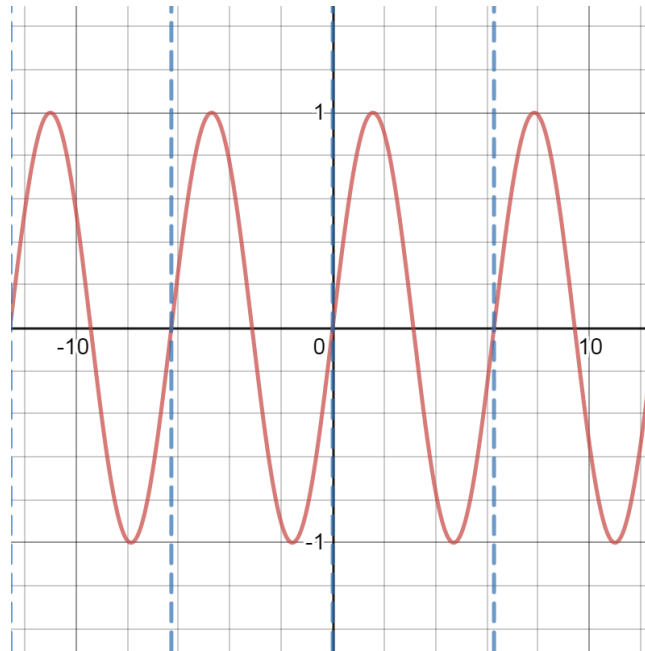
Thus the scale for the x -axis has been chosen as:

$$-4\pi < x < 4\pi$$

Which encompasses a total range of $8\pi = 4 * 2\pi$

or **four periods:**

$$f(\theta) = \sin(\theta)$$



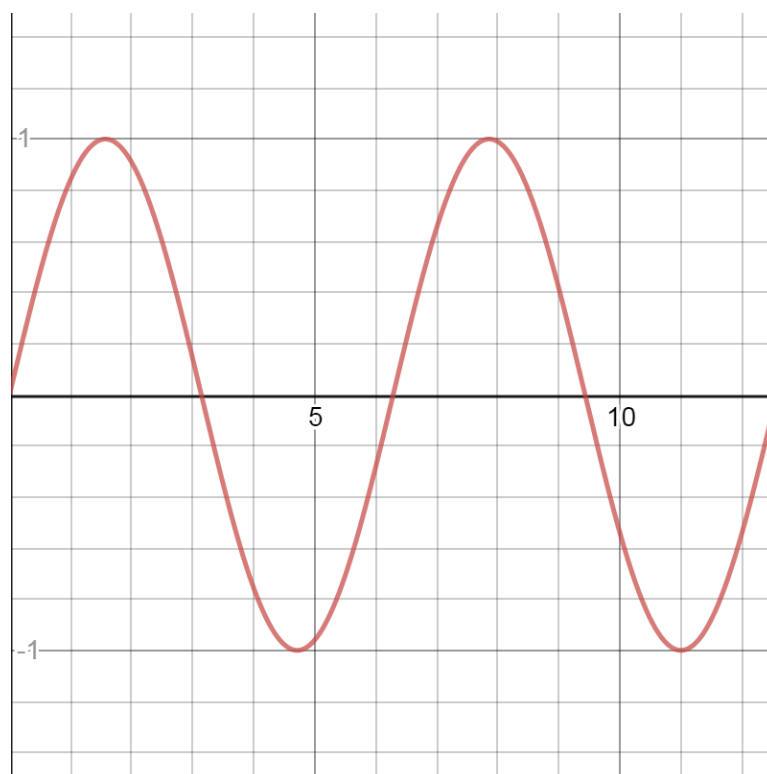
Note also that I have scaled the graph on the y -axis:

$$-1.5 < y < 1.5$$

Because I wanted to make sure that I included the entire graph, which only goes from -1 to 1 on the y -axis.

Suppose I wanted to use a different scale for my graph. Suppose, for example, I only wanted to show two periods:

$$f(\theta) = \sin(\theta)$$



Here I have selected as my domain of x -values

$$0 < \theta < 4\pi$$

. . . which makes the graph look a little different, less condensed.

We are going to be graphing trigonometric functions, and for these problems, our standard will be to

show two full periods of the graph

With

$$f(\theta) = \sin(\theta)$$

We note that the graph starts at

$$(0,0)$$

goes up, reaches a maximum of 1 at

$$\left(\frac{\pi}{2}, 1\right)$$

decreases and crosses the x -axis at

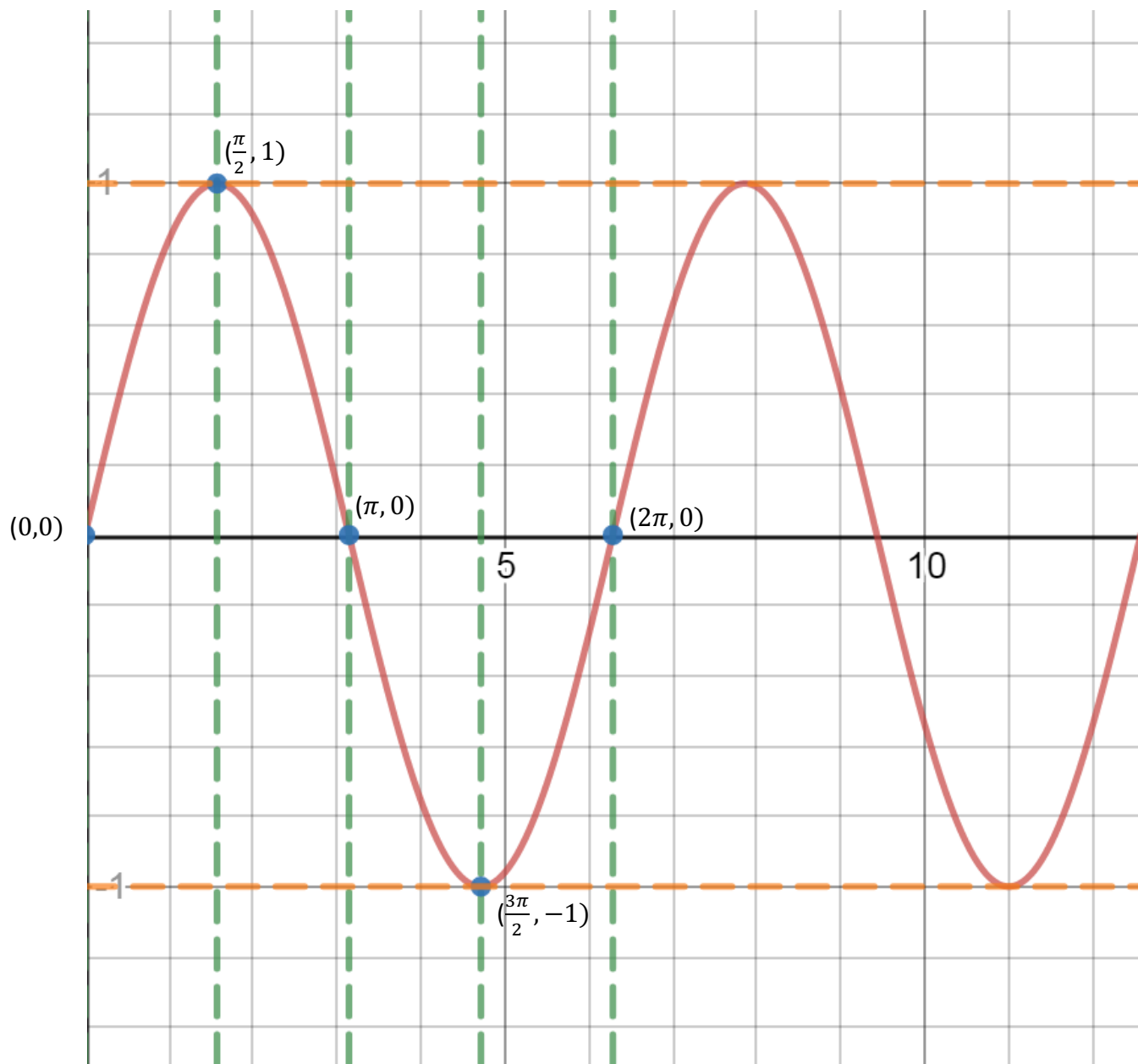
$$(\pi, 0)$$

continues to decrease, reaching a minimum of -1 at

$$\left(\frac{3\pi}{2}, -1\right)$$

and then returns to the beginning of its cycle (completing a full period) at

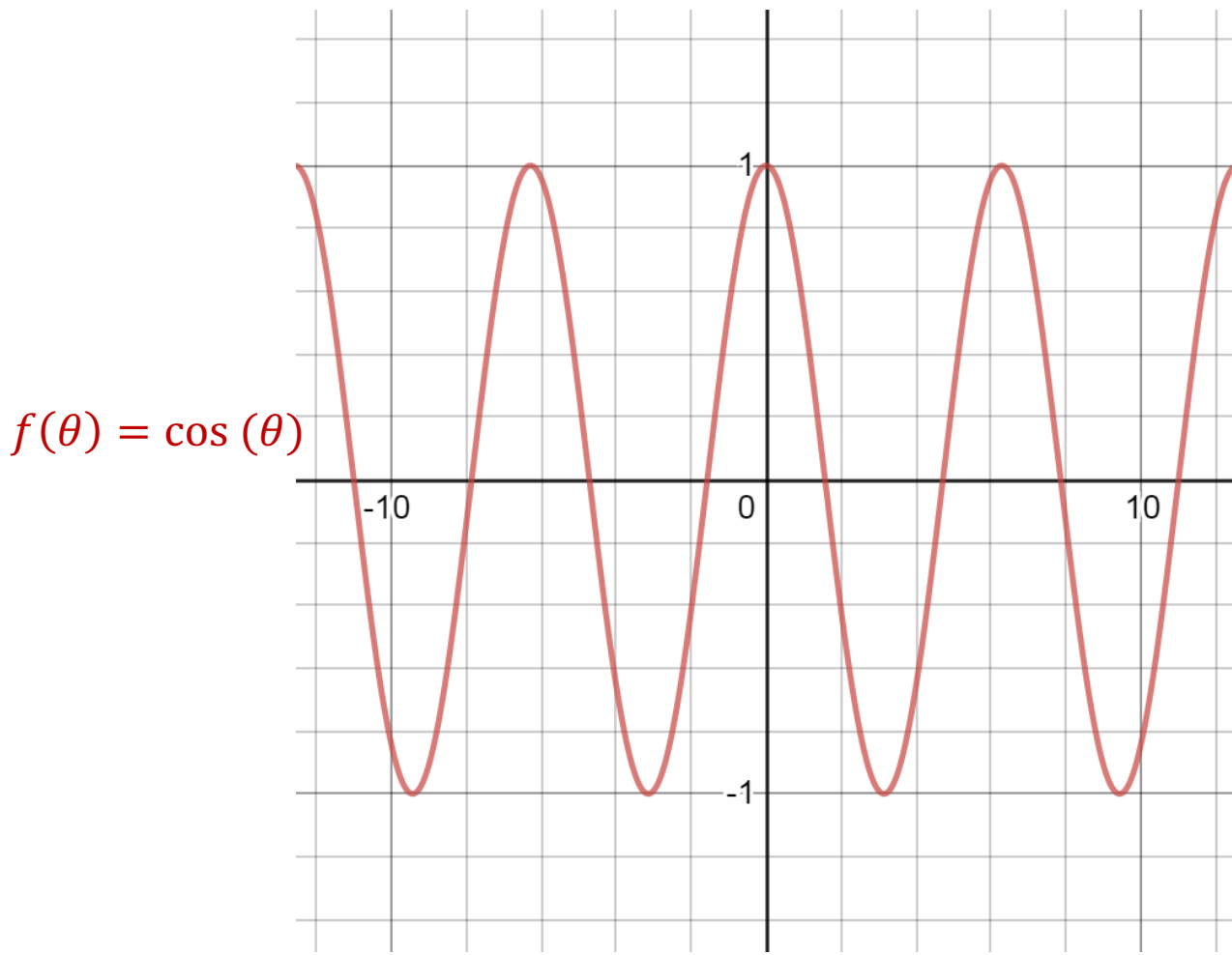
$$(2\pi, 0)$$



Here I have drawn the horizontal dotted lines to help delineate the highest and lowest points of the graph.

You will need to memorize this basic structure of the graph of sine.

Now let's look at cosine.



The above graph shows four full periods.

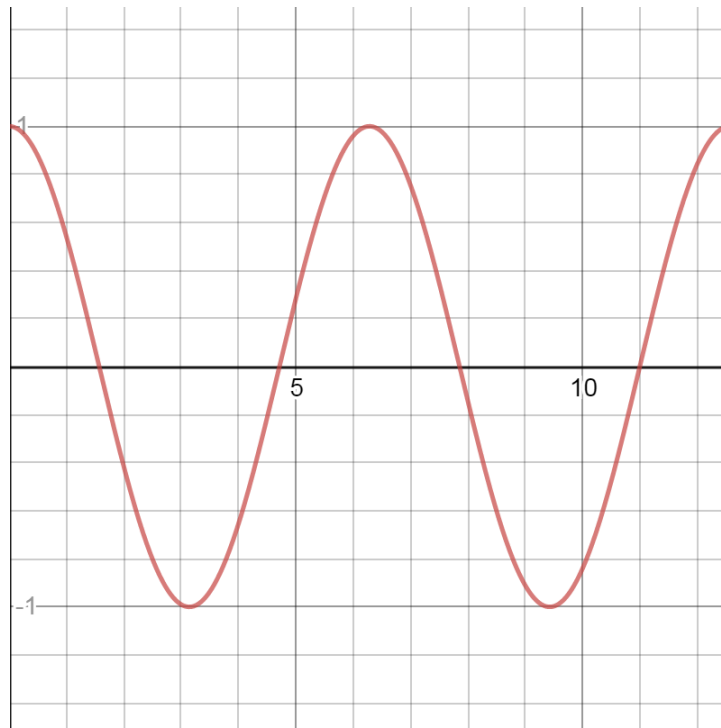
Note the similarities with sine.

The period of the cosine function is also 2π .

The maximum and minimum of the function is also ± 1 .

Let's look at two periods of cosine:

$$f(\theta) = \cos(\theta)$$



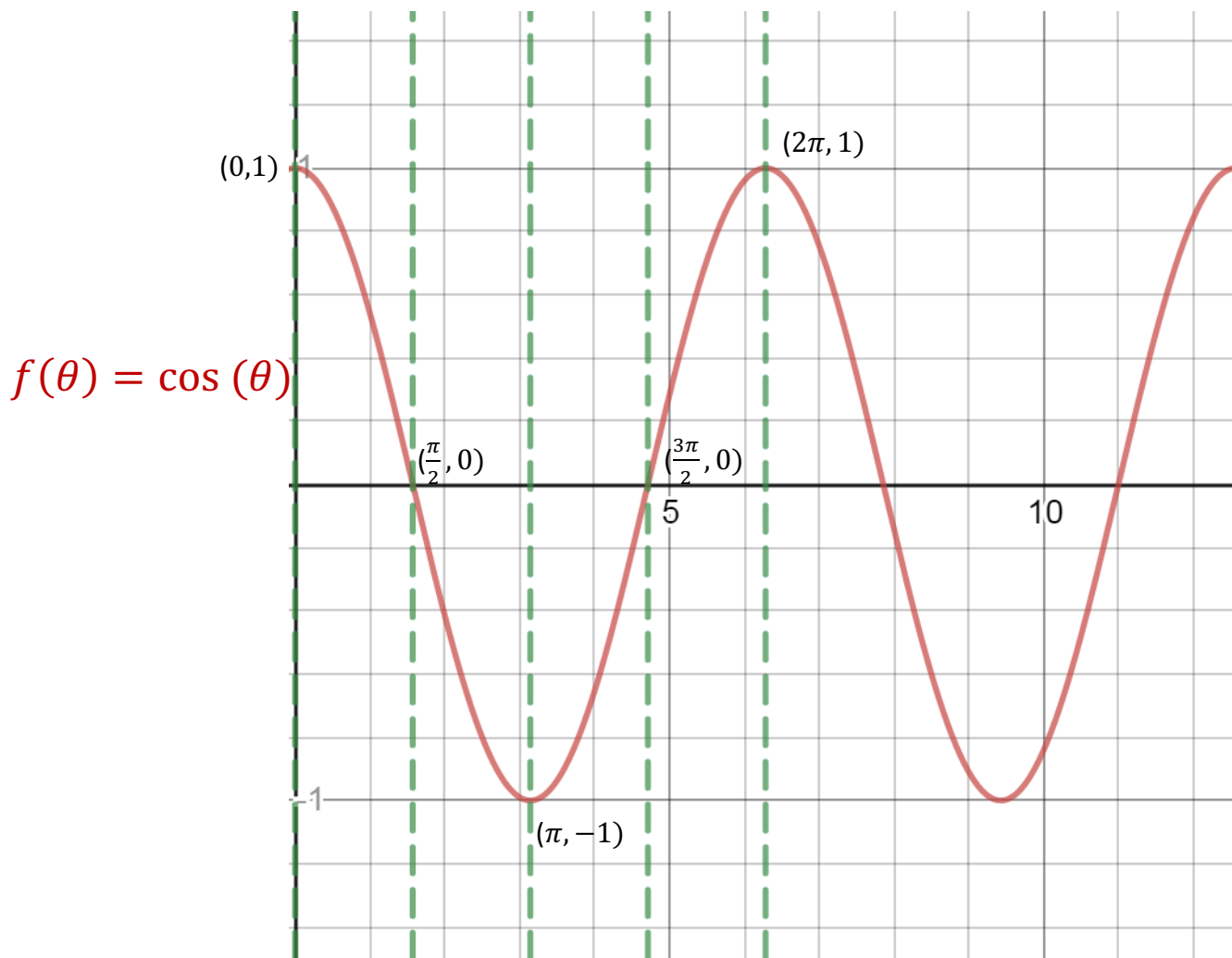
The function **begins at $(0, 1)$** . . .

. . . decreases until it crosses the x -axis at $(\frac{\pi}{2}, 0)$. . .

. . . reaches its minimum value of -1 at $(\pi, -1)$. . .

. . . crosses the x -axis again at $(\frac{3\pi}{2}, 0)$. . .

. . . and then completes one full period at the point $(2\pi, 1)$.



As with the basic graph of sine . . .

You will need to memorize this basic structure of the graph of cosine.

