Trigonometric Functions and Their Inverses

Math 102 Section 102
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Annoucements

- Course evaluations
- Study for final
- Three illusions
  - "No way! That person who fails the exam cannot be me."
  - "I only need to study on the day before the exam."
  - "With the book/solutions at hand, the knowledge jumps into my head."

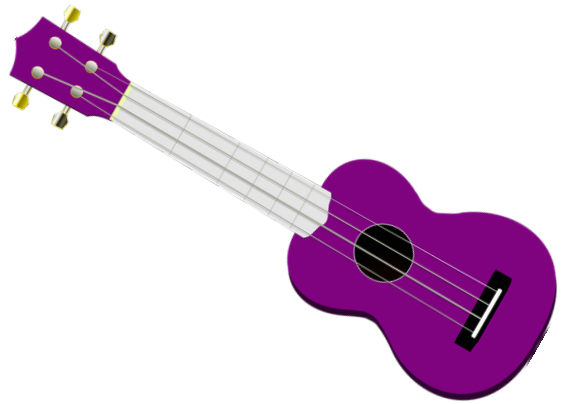
Last time

- Trig functions and motion around a circle
- Period, frequency
- Trig identities

Today: learning goals

- Explain amplitude, frequency, phase angle and phase shift
- Fit trig functions to describe rhythmic processes
- Define and apply inverse trig functions

Parameters of a trig function



Consider the trig function $y(t) = A\sin(\omega t + \phi)$.

- A is the amplitude, which controls the magnitude of oscillations. (volumn)
- ω is the frequency, which controls how fast the oscillations are. (pitch)
- $\omega t + \phi$ is the phase, where ϕ is the phase shift. (a shift of the graph along the x-axis)

Sine and cosine

Q1. $\sin(x)$ and $\cos(x)$ are essentially the same function, because $\sin(x) =$

A. $\cos(x)$

B. $\cos(x + \pi/2)$

C. $\cos(x - \pi/2)$

D. $\cos(x + \pi)$

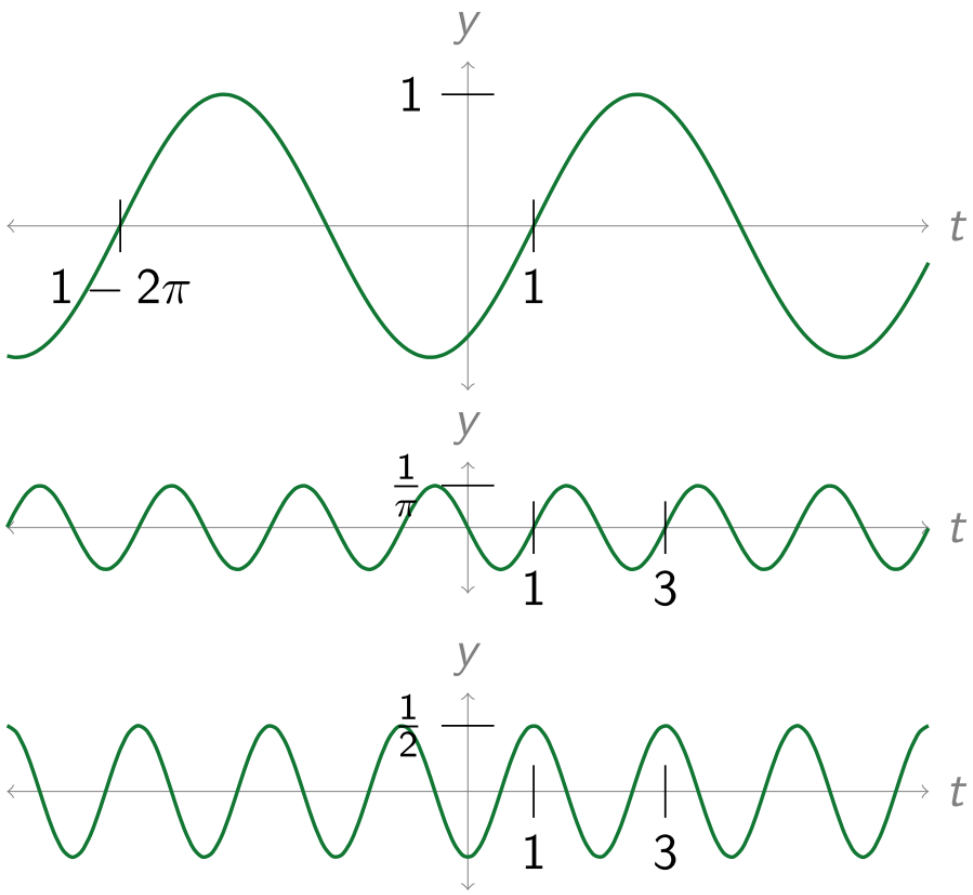
E. $\cos(x - \pi)$

$\sin(x) = \cos(\pi/2 - x) = \cos(x - \pi/2)$ since $\cos$ is an even function. Therefore, $\sin$ is $\cos$ offset by $\pi/2$ along the x-axis.

The shape of of sine functions

Example (Transform of sine functions)

Write each of the following functions in the form $y(t) = A\sin(\omega t + \phi)$. (Document camera)



The shape of of sine functions

Example (Transform of sine functions)

Sketch the function $y = 1 + 2\sin(2\pi x + 0.8\pi)$. (Document camera)

Application of trig functions

- Trig functions can be used to descibe some rhythmic/periodic/oscillatory processes.

Example (Fitting a trig function to a rhythmic process)

The level of a certain hormone in the bloodstream fluctuates between undetectable concentration at $t = 7:00$ and 100 ng/ml (nanograms per millilitre) at $t =$19:00 hours. Approximate the cyclic variations in this hormone level with an appropriate periodic trigonometric function. Let t represent time in hours from 0:00 hrs through the day.

Summary

Amplitude, frequency, and phase shift completely describe the shape of a sine function.

Answers

1. C