Section 3.5 : Derivatives of Trigonometric Functions

Chapter 3 : Differentiation

Math 1551, Differential Calculus

"No great discovery was ever made without a bold guess."

– Isaac Newton

Section 3.5 Derivatives of Trigonometric Functions

Topics

1. Derivatives of the trigonometric functions

Learning Objectives

For the topics in this section, students are expected to be able to:

1. Differentiate trigonometric functions.

In this lecture we will revisit sketching the derivative of a function (which we explored in Section 3.4).

In-Class Participation Activity: Worksheet

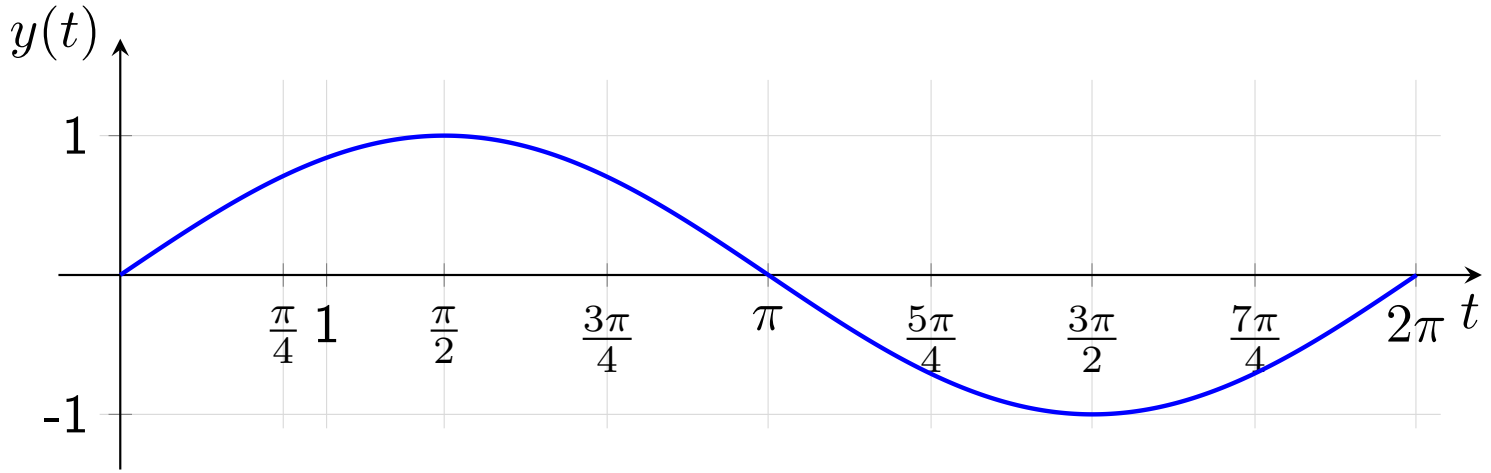
Some of the examples in these slides are incorporated into a worksheet.

The usual grading scheme applies:

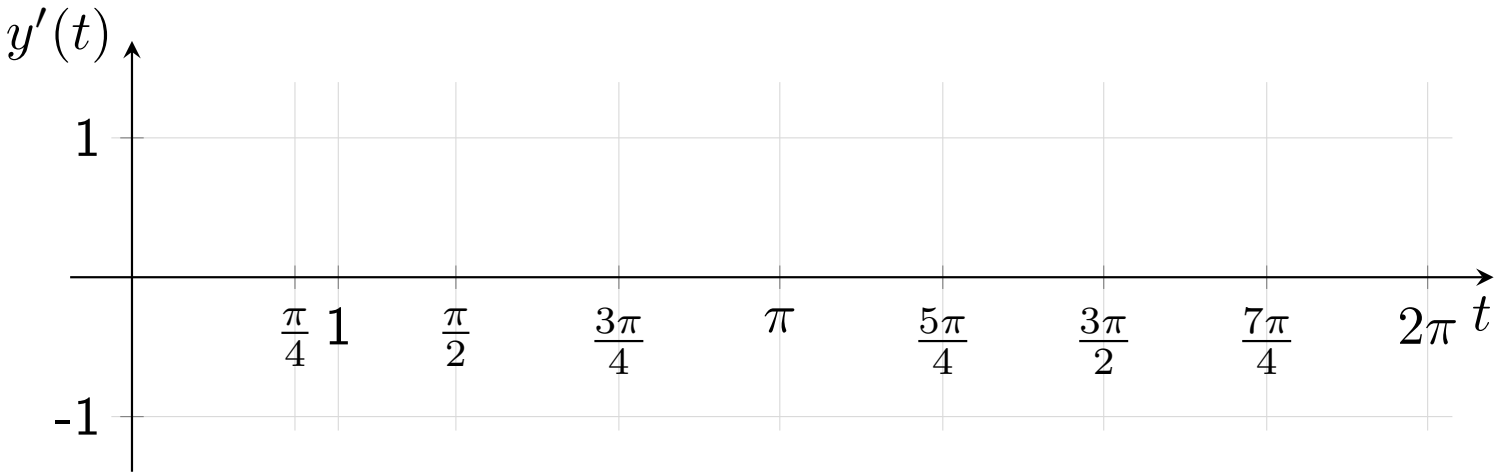
- Please solve worksheet problems in groups of 2 or 3 students
- Each group submits **one** completed worksheet
- Clearly print full names at the top of your sheet
- Every student in a group gets the same grade
- Grading scheme per question:
  - 0 marks for no work, for students working by themselves, or for working in a group of 4 or more
  - 1 mark for starting the problem or for a final answer with insufficient justification
  - 2 marks for a complete solution

Example 1

a) Below is a plot of $y(t) = \sin(t)$ for $t \in [0, 2\pi]$.



Plot $y'(t)$ by estimating the slope of the tangent line at each point.



b) Which function does $y'(t)$ look like?

Derivatives of the Trigonometric Functions

Suppose the angle x is given in radians.

$\frac{d}{dx}\sin x =$

$\frac{d}{dx}\csc x =$

$\frac{d}{dx}\cos x =$

$\frac{d}{dx}\sec x =$

$\frac{d}{dx}\tan x =$

$\frac{d}{dx}\cot x =$

Please memorize these derivatives before your next midterm.

Additional Examples

1. Differentiate $\csc x$ to show that

$$\frac{d}{dx}\csc x = -\csc x \cot x$$

   Hint: use the quotient rule.

2. Construct the equation of the tangent line to $y(x) = e^x \cos(x)$ at $x = 0$.