Math 1300: Calculus I **Fall 2020**

Lecture: Section 3.9: Linear Approximation

Lecturer: Sarah Arpin

Today's Goal: Learn how to approximate functions using calculus.

Logistics: We will start and finish this section on Monday. There is a check-in Friday, it's set to cover the topics we are covering this week: linear approximation, min/max problems, and extreme value theorem (Sections 3.9 & 4.2).

Warm-Up 1.1 *Find the equation of the tangent line to the curve* $y = \ln(\sin^2(x) + 1)$ *at* $x = \pi/4$.

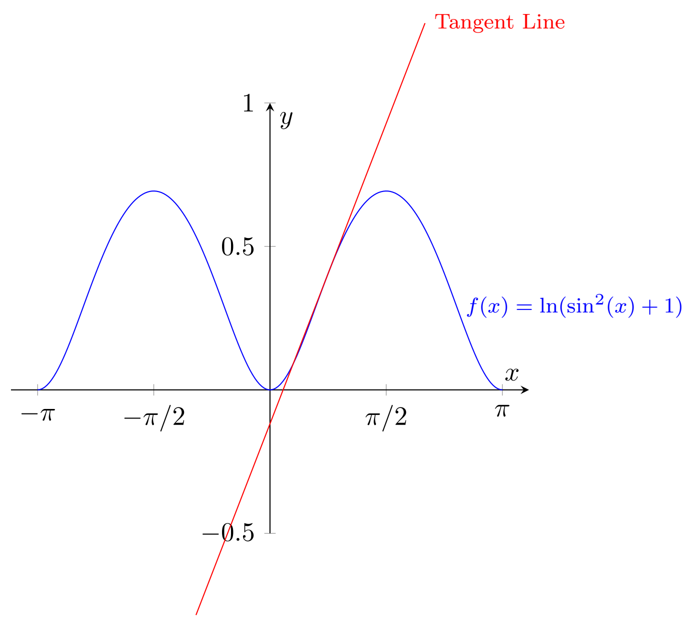
(A) $y = \frac{3}{2}(x - \pi/4) + \ln(3/2)$

(B) $y = \frac{2}{3}(x - \pi/4) + \ln(3/2)$

(C) $y = \frac{3}{2}(x - \pi/4) - \ln(2/3)$

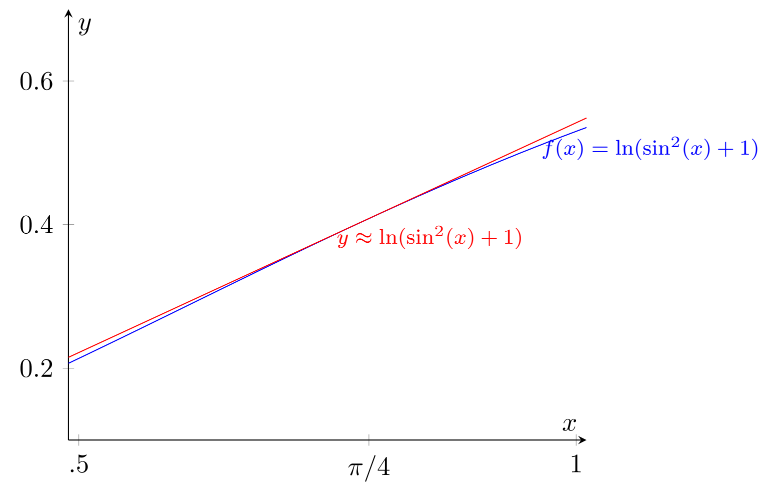
(D) $y = \frac{2}{3}(x + \pi/4) + \ln(2/3)$

(E) None of the above.



1.1 Why Tangent Lines?

What can we *use* the tangent line to a curve for?'



Definition 1.2 *To capture this idea of approximation, we call the tangent line to the curve* $y = f(x)$ *at* $x = a$ *the* ***linearlization*** *of* $f(x)$ *at* a*.*

Example 1.3 *Use the linearlization of* $y = \ln(\sin^2(x)+1)$ *at* $x = \pi/4$ *to estimate the value* $\ln(\sin^2(\pi/5)+1)$*.*

Example 1.4 *Find the linearization of* $y = \sqrt[5]{x+1}$ *at* $a = 1$ *and use it to approximate the value* $\sqrt[5]{2.1}$

Example 1.5 *Use the linearization of some function to estimate the value of* $\ln(1.1)$ *without using a calculator. Justify your choice of function and the location of the linearization.*