Today: Trig derivatives and implicit differentiation.

Homework before Thursday’s class: watch videos 4.1, 4.2.
Compute the derivatives of the following functions:

- \( f(x) = \tan(3x^2 + 1) \)
- \( f(x) = (\cos x)(\sin 2x)(\tan 3x) \)
- \( f(x) = \cos(\sin(\tan x)) \)
- \( f(x) = \cos \left( 3x + \sqrt{1 + \sin^2 x^2} \right) \)
Let

\[ g(x) = \cos x. \]

Obtain and prove a formula for its derivative directly from the definition of derivative as a limit.

**Hint:** Imitate the derivation in Video 3.11. If you need a trig identity that you do not know, google it or ask your neighbor.
Derivatives of the other trig functions

Using all the basic differentiation rules, as well as

\[ \frac{d}{dx} \sin x = \cos x, \quad \frac{d}{dx} \cos x = -\sin x, \]

quickly obtain and prove formulas for the derivatives of tan, cot, sec, and csc.
The equation

\[ \sin(x + y) + xy^2 = 0 \]

defines a function \( y = h(x) \) near \((0, 0)\).

Using implicit differentiation, compute

1. \( h(0) \)
2. \( h'(0) \)
3. \( h''(0) \)
4. \( h'''(0) \)