QUIZ II

Problem 1. Find the derivative of the following functions:

- $f(x) = -\ln(\cos(x))$. Chain rule:

  $$f'(x) = \frac{-1}{\cos(x)} - \sin(x) = \frac{\sin(x)}{\cos(x)} = \tan(x).$$

- $g(x) = \sin(x)\cos(x)$. Product rule:

  $$g'(x) = \cos(x)\cos(x) + \sin(x)(-\sin(x)) = \cos^2(x) - \sin^2(x) = \cos(2x).$$

  Alternatively we can write g as $g(x) = \dfrac{\sin(2x)}{2}$, and then directly $g'(x) = \dfrac{2\cos(2x)}{2} = \cos(2x)$.

- $h(x) = 3e^x$. Constant multiple rule:

  $$h'(x) = 3e^x.$$

- $a(x) = e^{\left(\frac{x^2}{\sin(x)}\right)}$

- $w(x) = (x^3 - 2x + 1)^{10}$

- $i(x) = \dfrac{\sqrt{x}}{2^x}$

- $j(x) = \cot(x)e^x$

Problem 2. Real world examples of derivatives. Fill each blank with a word from the list: slope, acceleration, force, velocity, marginal cost.

- If t is time and $v(t)$ velocity, then $\frac{dv(t)}{dt}$ is _____
- If x is distance and $f(x)$ is height, then $\frac{df(x)}{dx}$ is _____
- If t is time and $D(t)$ is distance, then $\frac{dD(t)}{dt}$ is _____
- If x is distance and $w(x)$ is work, then $\frac{dw(t)}{dx}$ is _____
- If t is time and $c(x)$ is total cost of production, then $\frac{dc(t)}{dx}$ is _____