

Math 185 – Assignment #4**Name:** _____

1. Find the derivative $\frac{dy}{dx}$ for the following functions.

a) $y = (1 - \sin^2 x)^4$

b) $y = \cos^{-1}(5x^3)$

c) $y = (e^{3/x} \tan x)^2$

d) $x \cos 2y + \sin x \cos y = 1$

2. Find the derivative $f'(x)$ for the following functions. These ones should simplify nicely.

a) $f(x) = x \cos^{-1} x - \sqrt{1-x^2}$

b) $f(x) = \ln(\cos x)$

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3. Rewrite $y = \sec x$ in terms of the basic trig functions $\sin x$ and/or $\cos x$ and then differentiate in order to **derive** the rule for differentiating the secant function. (At least here, you know what the answer will be!)
4. A block sitting on a frictionless tabletop is attached to a spring and given a push. The block then oscillates back and forth, with the horizontal displacement given by $x = 5 \sin(2\pi t)$, where x is in centimetres, t is in seconds, and the product $2\pi t$ has units of radians. Find the velocity and acceleration of the block at $t = 1$ second.

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5. A surveyor measures two sides and the included angle of a triangular parcel of land to be 2 km, 2 km, and 120° . Use a differential to estimate the error in determining the length of the third side if the angle has an error of 1° .

6. A ladder is slipping down a vertical wall. The ladder is 5 m long and the top of it is slipping down the wall at a constant rate of 0.3 m/s. Let θ be the angle that the ladder makes with the ground. When θ equals 53.1° , at what rate is θ changing? You may leave your answer in rads/second if you wish.

(For ease of calculation, use $\sin 53.1^\circ \approx 4/5$ and $\cos 53.1^\circ \approx 3/5$.)