1. Compute

$$\frac{d}{dt}\left[2\pi\frac{t-80}{365}\right].$$

Don't you dare use the quotient rule.

2. Find **all** values θ such that $\cos(\theta) = 1$.

3. Find all values x such that $\cos(3x) = 1$.

4. I'm tired of doing all the work around here. It's your turn. You're going to show that

$$\frac{d}{dx}\ln(x) = \frac{1}{x}.$$

Start with the equation $y = \ln(x)$.

1. Solve this equation for x.

2. Take an implicit derivative with respect to x, and solve for dy/dx.

3. Now convert dy/dx into an expression that only involves x. (Tah dah!)

5. Compute $\frac{d}{dx}\ln\left(x + e^{3x}\right)$.

6. Compute $\frac{d}{dx}\ln(\cos(x))$ and simplify your expression.

7. How can we compute $\frac{d}{dx}5^x$?

1. Rewrite $5^x = e^{ax}$ for a certain constant a. Your job is to find a!

2. Now compute $\frac{d}{dx}5^x$ by taking the derivative of e^{ax} instead.

3. Rewrite your previous answer so that the letter e does not appear.

8. Derive a formula for $\frac{d}{dx}\log_5(x)$. You can either use a change of base formula, or you can repeat the technique used to find the derivative of $\ln(x)$. Heck, do it both ways.

9. We wish, for whatever bizarre reason, to compute dy/dx if

$$y = \frac{(x^2+1)(x+3)^{1/2}}{x-1}.$$

One can use the product and quotient rules. Here's an alternative technique known as logarithmic differentiation.

1. Take the natural logarithm of both sides of the equation.

2. Use log rules such as $\ln(AB) = \ln(A) + \ln(B)$ to expand the right-hand side of this equation

3. Compute (implicitly) dy/dx and solve for dy/dx.

4. Convert the expression for dy/dx so that it only involves x, and there are no appearances of y.