MAT 136 (Calculus I), Prof. Jim Swift
In-Class Worksheet: Derivative Shortcuts 4.

key

For each of these functions, fill in the blank with the derivative *if* you can do so using the rules we have learned so far in this class, possibly after an algebraic manipulation of the expression. Otherwise, write "Can't do yet."

Let $f(x) = x^2 - 3x + 7$. Then $f'(x) = 2x - 3$, $f''(x) = 2$, and $f'''(x) = 0$.

Let $g(x) = x\tan(x)$. $g'(x) = 1 \cdot \tan(x) + x \cdot \frac{1}{\cos^2(x)}$

Let $h(x) = \sin(5x)$. $h'(x) =$ Can't do yet. (Requires chain rule)

Let $y = 2\sin(x) + 3\cos(x)$.

$$\frac{dy}{dx} = 2\cos(x) - 3\sin(x)$$

$$\frac{d^2y}{dx^2} = -2\sin(x) - 3\cos(x)$$

Note: $\frac{d^2y}{dx^2} = -y$ for all x.

Let $f(x) = \cos(x^2)$. $f'(x) =$ Can't do yet (Requires chain rule)

Let $y = \csc(x)$. When you see a "third string" trig function like this, immediately replace it with the equivalent in terms of sine and/or cosine. Thus $y = \csc(x) = \frac{1}{\sin(x)}$, and

$$\frac{dy}{dx} = \frac{d}{dx}\left[\frac{1}{\sin(x)}\right] = \frac{0 \cdot \sin(x) - 1\cos(x)}{(\sin(x))^2} = \frac{-\cos(x)}{\sin^2(x)}.$$

Note: Recall that $\sin^{-1}(x)$ does *not* mean $[\sin(x)]^{-1}$, even though $\sin^2(x)$ *does* mean $[\sin(x)]^2$. Instead, $\sin^{-1}(x)$ is the inverse sine function. Do not confuse $\csc(x) = \frac{1}{\sin(x)}$ with $\sin^{-1}(x)$