

## MATH 210: 9-20 WORKSHEET

### ATOMIC RULES

$$\frac{d}{dx} \ln x = \frac{1}{x}$$

$$\frac{d}{dx} \tan x = \sec^2 x$$

$$\frac{d}{dx} \sec x = \sec x \tan x$$

$$\frac{d}{dx} \cot x = -\csc^2 x$$

$$\frac{d}{dx} \csc x = -\csc x \cot x$$

### COMBINATION RULES

$$\frac{d}{dx} (u(x) \cdot v(x)) = u'(x)v(x) + u(x)v'(x)$$

$$\frac{d}{dx} \left( \frac{u(x)}{v(x)} \right) = \frac{u'(x)v(x) - u(x)v'(x)}{v(x)^2}$$

Differentiate the following functions:

- $a(x) = (x - 2)(x - 1) + 4 \sec x$
- $b(x) = \frac{\sin x}{\cos x}$
- $c(x) = x^2 e^x$
- $d(x) = \frac{x + 1}{x^2 + 1}$
- $f(x) = e^x \cos x$
- $g(x) = x \tan x - x$
- $h(x) = x \ln x - x$
- $i(x) = \frac{\csc x}{x}$
- $j(x) = \sin x \cot x + \sin x \cos x$

Compute the following second derivatives, using what you did above:

- $c''(x)$
- $g''(x)$
- $h''(x)$
- $i''(x)$