DIFFERENTIATING EXPONENTIAL FUNCTIONS:

$$\frac{d}{dx}(e^x) = e^x$$

$$\frac{d}{dx}e^{f(x)} = f'(x)e^{f(x)} \text{ hint: chain rule!}$$

Product, quotient and chain rule also apply to exponential functions.

Product Rule: $\frac{d}{dx}[f(x)g(x)] = f'(x)g(x) + f(x)g'(x)$

Quotient Rule: $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

Chain Rule: $\frac{d}{dx}[f(g(x))] = f'(g(x))g'(x)$

Other helpful rules:

$\frac{d}{dx}(a^x) = (\ln a)a^x$ (hint: $y = a^x = e^{x \ln a}$)

$\frac{d}{dx}(a^{f(x)}) = (\ln a)f'(x)a^{f(x)}$

8.5 WORKED EXAMPLE

Differentiate xe^x with respect to x:

8.6 WORKED EXAMPLE

Differentiate xe^{-6x^9} with respect to x: