

ERTH 103: Some useful math from way back when!

Logs:

$$\ln(a) + \ln(b) = \ln(ab) \quad \ln(a) - \ln(b) = \ln\left(\frac{a}{b}\right) \quad b \ln(a) = \ln(a^b)$$

$$e^{\ln(a)} = a \quad \ln(e^a) = a$$

Differentiation:

$$\frac{d}{dx}(x^a) = ax^{a-1} \quad \frac{d}{dx}(e^{ax}) = ae^{ax} \quad \frac{d}{dx}u(y) = \frac{du}{dy} \frac{dy}{dx}$$

$$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx} \quad \frac{d}{dx}\left(\frac{u}{v}\right) = -\frac{u}{v^2} \frac{dv}{dx} + \frac{1}{v} \frac{du}{dx}$$

Integration (don't forget constants of integration for indefinite integrals):

$$\int x^a dx = \frac{x^{a+1}}{a+1} + C \quad \int \frac{1}{x} dx = \ln(x) + C$$

$$\int \frac{dy}{dx} dx = y + C \quad \int \frac{d^2y}{dx^2} dx = \frac{dy}{dx} + C \quad \text{remember} \quad \frac{d^2y}{dx^2} = \frac{d}{dx} \left( \frac{dy}{dx} \right)$$

$$\int e^{ax} dx = \frac{1}{a} e^{ax} + C$$