

## Derivatives and Integrals for the Exponential and Log Functions

### Exponential Functions

*Derivative of a base  $a$  Exponential*

$$(a^x)' = a^x \ln a$$

General

$$(a^u)' = a^u \ln a \cdot u'$$

*Derivative of an  $e$ -function*

$$(e^x)' = e^x$$

General

$$(e^u)' = e^u u'$$

*Integral of a base  $a$  Exponential*

$$\int a^x dx = \frac{a^x}{\ln a} + C$$

General

$$\int a^u du = \frac{a^u}{\ln a} + C$$

*Integral of an  $e$ -function*

$$\int e^x dx = e^x + C$$

General

$$\int e^u du = e^u + C$$

### Logarithmic Functions

*Derivatives of base  $b$  logs*

$$(\log_b x)' = \frac{1}{x \log b}$$

General

$$(\log_b u)' = \frac{1}{u \log b} u' = \frac{u'}{u \log b}$$

*Derivatives of base  $e$  logs*

$$(\ln x)' = \frac{1}{x}$$

General

$$(\ln u)' = \frac{1}{u} u' = \frac{u'}{u}$$

*Integrals of Functions that Produce  $\ln$  Antiderivatives*

$$\int \frac{1}{x} dx = \ln x + C$$

General

$$\int \frac{1}{u} du = \ln u + C$$