

General Rules  $k$  is a constant,  $u, v$  functions of  $x$ .

(1) If  $k$  is a constant, then  $\frac{d}{dx}k = 0$ .

(2) If  $n$  is a real number, then  $\frac{dx^n}{dx} = nx^{n-1}$ .

(3)  $\frac{d(ku)}{dx} = k\frac{du}{dx}$ .

(4)  $\frac{d(u+v)}{dx} = \frac{du}{dx} + \frac{dv}{dx}$ .

(5) (Product rule)  $\frac{d(u \cdot v)}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$ .

(6) (Quotient rule)  $\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$ .

Specific Functions

• For  $a$  constant,  $\frac{da^x}{dx} = \ln a \cdot a^x$ . In particular  $\frac{de^x}{dx} = e^x$ .

•  $\frac{d}{dx} \sin x = \cos x$ ,  $\frac{d}{dx} \cos x = -\sin x$ .

•  $\frac{d}{dx} \tan x = \sec^2 x$ ,  $\frac{d}{dx} \cot x = -\csc^2 x$ ,  $\frac{d}{dx} \sec x = \sec x \tan x$ ,  $\frac{d}{dx} \csc x = -\csc x \cot x$ .