## Derivative Table

In the following $a$, $b$, and $\omega$ are constants:

$$\frac{d}{dt}(a) = 0 \tag{1}$$

$$\frac{d}{dt}(t) = 1 \tag{2}$$

$$\frac{d}{dt}(t^n) = nt^{n-1} \tag{3}$$

$$\frac{d}{dt}(at^n + b) = nat^{n-1} \tag{4}$$

$$\frac{d}{dt}(at + b)^n = na(at + b)^{n-1} \tag{5}$$

$$\frac{d}{dt}\sin(\omega t + b) = \omega\cos(\omega t + b) \tag{6}$$

$$\frac{d}{dt}\cos(\omega t + b) = -\omega\sin(\omega t + b) \tag{7}$$

$$\frac{d}{dt}e^{at} = ae^{at} \tag{8}$$

$$\frac{d}{dt}\ln t = \frac{1}{t} \tag{9}$$

General rules for combinations of functions:

$$\frac{d}{dt}[f(t) + g(t)] = \frac{df}{dt} + \frac{dg}{dt} \tag{10}$$

$$\frac{d}{dt}[f(t)g(t)] = \frac{df}{dt}g + f\frac{dg}{dt} \tag{11}$$

$$\frac{d}{dt}[f(t)]^n = n[f(t)]^{n-1}\frac{df}{dt} \tag{12}$$

## Anti-derivative (Integral) Table

In the following $a$, $b$, and $\omega$ are constants and $C$ is an undetermined integration constant:

$$\int \frac{df}{dt}dt = f(t) + C \tag{13}$$

$$\int a dt = at + C \tag{14}$$

$$\int t^n dt = \frac{t^{n+1}}{n+1} + C \qquad \text{for n} \neq -1 \tag{15}$$

$$\int (at^n + b)dt = \frac{at^{n+1}}{(n+1)} + bt + C \qquad \text{for n} \neq -1 \tag{16}$$

$$\int (at + b)^n dt = \frac{(at + b)^{n+1}}{a(n+1)} + C \qquad \text{for n} \neq -1 \tag{17}$$

$$\int \sin(\omega t + b)dt = -\frac{1}{\omega}\cos(\omega t + b) + C \tag{18}$$

$$\int \cos(\omega t + b)dt = \frac{1}{\omega}\sin(\omega t + b) + C \tag{19}$$

$$\int e^{at}dt = \frac{1}{a}e^{at} + C \tag{20}$$

$$\int \frac{dt}{t} = \ln t + C \qquad \text{where } t > 0 \tag{21}$$

General form for a definite integral:

$$\int_a^b \frac{df}{dt}dt = f(b) - f(a) \tag{22}$$