Calculus 2 Derivative and Integral

Chapter 7

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

Chain Rule $\frac{d}{dx}(e^u) = e^u \frac{du}{dx}$

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

u-substitution $\int e^u dx = e^u + c$

$$\frac{d}{dx}\big(ln(x)\big) = \frac{1}{x} \text{ for } x > 0$$

Chain Rule $\frac{d}{dx}\big(ln(u)\big) = \frac{1}{u} \cdot \frac{du}{dx}$

$$\frac{d}{dx}(ln|x|) = \frac{1}{x} \text{ for } x \neq 0$$

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

u-substitution $\int \frac{1}{u} du = ln(|u|) + C$

$$\int \tan(x)dx = ln(|\sec(x)|) + C$$

$$\frac{d}{dx}\left(log_b(x)\right) = \frac{1}{\ln(b)\,x}$$

Chain Rule $\frac{d}{dx}\left(log_b(u)\right) = \frac{1}{\ln(b)x} \cdot \frac{du}{dx}$

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

Chain Rule $\frac{d}{dx}(b^u) = \ln(b)b^u \cdot \frac{du}{dx}$

$$\int b^x dx = \frac{b^x}{\ln(b)} + C$$

u-substitution $\int b^u dx = \frac{b^u}{\ln(b)} + C$

$$\frac{d}{dx}\left(sin^{-1}(x)\right) = \frac{1}{\sqrt{1-x^2}}$$

Chain Rule $\frac{d}{dx}\left(sin^{-1}(u)\right) = \frac{1}{\sqrt{1-u^2}} \cdot \frac{du}{dx}$

$$\int \frac{1}{\sqrt{1-x^2}}\,dx = sin^{-1}(x) + C$$

u-substitution $\int \frac{1}{\sqrt{1-u^2}}\,dx = sin^{-1}(u) + C$

$$\frac{d}{dx}\left(cos^{-1}(x)\right) = -\frac{1}{\sqrt{1-x^2}}$$

Chain Rule $\frac{d}{dx}\left(cos^{-1}(u)\right) = -\frac{1}{\sqrt{1-u^2}} \cdot \frac{du}{dx}$

$$\frac{d}{dx}\left(tan^{-1}(x)\right) = \frac{1}{1+x^2}$$

Chain Rule $\frac{d}{dx}\left(tan^{-1}(u)\right) = \frac{1}{1+u^2} \cdot \frac{du}{dx}$

$$\int \frac{1}{1+x^2}\,dx = tan^{-1}(x) + C$$

u-substitution $\int \frac{1}{1+u^2}\,dx = tan^{-1}(u) + C$

$$\int \frac{1}{a^2 + x^2}\, dx = \frac{1}{a} tan^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{\sqrt{a^2 - x^2}}\, dx = sin^{-1}\left(\frac{x}{a}\right) + C$$

$$\frac{d}{dx}\left(sec^{-1}(x)\right) = \frac{1}{x\sqrt{x^2 - 1}}$$

Chain Rule $\frac{d}{dx}\left(sec^{-1}(u)\right) = \frac{1}{u\sqrt{u^2-1}} \cdot \frac{du}{dx}$

$$\int \frac{1}{x\sqrt{x^2 - 1}}\, dx = sec^{-1}(x) + C$$

u-substitution $\int \frac{1}{u\sqrt{u^2-1}}\, dx = sec^{-1}(u) + C$