

Important Derivatives and Integrals

You should be able to derive the starred (*) items. Please learn these as we cover them.

Derivatives

- (1) $\frac{d}{dx}[af(x) + bg(x)] = af'(x) + bg'(x)$
- (2) $\frac{d}{dx}f(x) \cdot g(x) = f'(x)g(x) + f(x)g'(x)$
- (3) $\frac{d}{dx} \frac{f(x)}{g(x)} = \frac{f'(x)g(x) - f(x)g'(x)}{g(x)^2}$
- (4) $\frac{df}{dx}f(u(x)) = f'(u(x))u'(x)$
- (5) $\frac{d}{dx}u^n = nu^{n-1} \frac{du}{dx}$
- (6) $\frac{d}{dx} \sin(u) = \cos(u) \frac{du}{dx}$
- (7) $\frac{d}{dx} \cos(u) = -\sin(u) \frac{du}{dx}$
- (8) * $\frac{d}{dx} \tan(u) = \sec^2(u) \frac{du}{dx}$
- (9) * $\frac{d}{dx} \cot(u) = -\csc^2(u) \frac{du}{dx}$
- (10) * $\frac{d}{dx} \sec(u) = \sec(u) \tan(u) \frac{du}{dx}$
- (11) * $\frac{d}{dx} \csc(u) = -\csc(u) \cot(u) \frac{du}{dx}$
- (12) $\frac{d}{dx}e^u = e^u \frac{du}{dx}$
- (13) * $\frac{d}{dx}b^u = \ln(b)b^u \frac{du}{dx}$
- (14) $\frac{d}{dx} \ln(u) = \frac{1}{u} \frac{du}{dx}$
- (15) $\frac{d}{dx} \log_b(u) = \frac{1}{\ln(b)u} \frac{du}{dx}$
- (16) * $\frac{d}{dx} \sin^{-1}(u) = \frac{1}{\sqrt{1-u^2}} \frac{du}{dx}$
- (17) * $\frac{d}{dx} \tan^{-1}(u) = \frac{1}{1+u^2} \frac{du}{dx}$
- (18) * $\frac{d}{dx} \sec^{-1}(u) = \frac{1}{|u|\sqrt{u^2-1}} \frac{du}{dx}$
- (19) * $\frac{d}{dx} \cos^{-1}(u) = \frac{-1}{\sqrt{1-u^2}} \frac{du}{dx}$
- (20) * $\frac{d}{dx} \cot^{-1}(u) = \frac{-1}{1+u^2} \frac{du}{dx}$
- (21) * $\frac{d}{dx} \csc^{-1}(u) = \frac{-1}{|u|\sqrt{u^2-1}} \frac{du}{dx}$

Integrals

- (1) $\int af(x) + cg(x)dx = a \int f(x)dx + b \int g(x)dx$
- (2) $\int x^n dx = \frac{1}{n+1}x^{n+1} + C \quad (n \neq -1)$
- (3) $\int x^{-1} dx = \ln|x| + C$
- (4) $\int \sin(x)dx = -\cos(x) + C$
- (5) $\int \cos(x)dx = \sin(x) + C$
- (6) * $\int \tan(x)dx = \ln|\sec(x)| + C$
- (7) * $\int \cot(x)dx = \ln|\sin(x)| + C$
- (8) * $\int \sec(x)dx = \ln|\sec(x) + \tan(x)| + C$
- (9) * $\int \csc(x)dx = -\ln|\csc(x) + \cot(x)| + C$
- (10) * $\int \sin^2(x)dx = \frac{x - \sin(x)\cos(x)}{2} + C$
- (11) * $\int \cos^2(x)dx = \frac{x + \sin(x)\cos(x)}{2} + C$
- (12) $\int \sec^2(x)dx = \tan(x) + C$
- (13) $\int \csc^2(x)dx = -\cot(x) + C$
- (14) * $\int \tan^2(x)dx = \tan(x) - x + C$
- (15) * $\int \cot^2(x)dx = -\cot(x) - x + C$
- (16) $\int \frac{1}{\sqrt{1-x^2}}dx = \sin^{-1}(x) + C$
- (17) $\int \frac{1}{|x|\sqrt{x^2-1}}dx = \sec^{-1}(x) + C$
- (18) $\int \frac{1}{x^2+1}dx = \tan^{-1}(x) + C$