

Basic properties of derivatives

1. $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$
2. $\frac{d}{dx}(k \cdot f(x)) = k \cdot f'(x).$
3. $\frac{d}{dx}(f(x) + g(x)) = f'(x) + g'(x).$
4. $\frac{d}{dx}(f(x) - g(x)) = f'(x) - g'(x).$
5. **Product Rule:** $\frac{d}{dx}(f(x) \cdot g(x)) = f(x) \cdot g'(x) + f'(x) \cdot g(x).$
6. **Quotient Rule:** $\frac{d}{dx} \left(\frac{f(x)}{g(x)} \right) = \frac{g(x) \cdot f'(x) - f(x) \cdot g'(x)}{(g(x))^2}.$
7. **Chain Rule:** $\frac{d}{dx}(f(g(x))) = f'(g(x)) \cdot g'(x).$

Derivatives from Calculus I

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| <ol style="list-style-type: none"> 1. $\frac{d}{dx}(c) = 0.$ 2. $\frac{d}{dx}(x^n) = nx^{n-1}.$ 3. $\frac{d}{dx}(\ln(x)) = \frac{1}{x}.$ 4. $\frac{d}{dx}(e^x) = e^x.$ 5. $\frac{d}{dx}(b^x) = \ln(b)b^x.$ 6. $\frac{d}{dx}(\sin(x)) = \cos(x).$ 7. $\frac{d}{dx}(\cos(x)) = -\sin(x).$ | <ol style="list-style-type: none"> 8. $\frac{d}{dx}(\tan(x)) = \sec^2(x).$ 9. $\frac{d}{dx}(\cot(x)) = -\csc^2(x).$ 10. $\frac{d}{dx}(\sec(x)) = \sec(x) \tan(x).$ 11. $\frac{d}{dx}(\csc(x)) = -\csc(x) \cot(x).$ 12. $\frac{d}{dx}(\tan^{-1}(x)) = \frac{1}{1+x^2}.$ 13. $\frac{d}{dx}(\sin^{-1}(x)) = \frac{1}{\sqrt{1-x^2}}.$ |
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Basic properties of indefinite and definite integration

1. $\int kf(x)dx = k \int f(x)dx.$
2. $\int [f(x) + g(x)]dx = \int f(x)dx + \int g(x)dx.$
3. $\int [f(x) - g(x)]dx = \int f(x)dx - \int g(x)dx.$
4. $\int_a^b f(x)dx = \lim_{n \rightarrow \infty} \sum_{k=1}^n f(x_k^*)\Delta x,$ where $\Delta x = \frac{b-a}{n}.$
5. $\int_a^a f(x)dx = 0.$
6. $\int_a^b f(x)dx = - \int_b^a f(x)dx.$
7. $\int_a^c f(x)dx = \int_a^b f(x)dx + \int_b^c f(x)dx.$

The Fundamental Theorem of Calculus

1. $\int_a^b f(x)dx = F(b) - F(a) = \left[\int f(x) \right]_a^b.$
2. $\frac{d}{dx} \left[\int_a^x f(t)dt \right] = f(x).$

Integrals from Calculus I

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| <ol style="list-style-type: none"> 1. $\int m dx = mx + C.$ 2. $\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad (n \neq -1).$ 3. $\int \frac{1}{x} dx = \ln x + C.$ 4. $\int e^x dx = e^x + C.$ 5. $\int b^x dx = \frac{b^x}{\ln(b)} + C \quad (0 < b, b \neq 1).$ 6. $\int \sin(x) dx = -\cos(x) + C.$ 7. $\int \cos(x) dx = \sin(x) + C.$ | <ol style="list-style-type: none"> 8. $\int \sec^2(x) dx = \tan(x) + C.$ 9. $\int \csc^2(x) dx = -\cot(x) + C.$ 10. $\int \sec(x) \tan(x) dx = \sec(x) + C.$ 11. $\int \csc(x) \cot(x) dx = -\csc(x) + C.$ 12. $\int \frac{1}{1+x^2} dx = \tan^{-1}(x) + C.$ 13. $\int \frac{1}{\sqrt{1-x^2}} dx = \sin^{-1}(x) + C.$ |
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