Rules of differentiation

1. $f(x) = k \quad \Rightarrow \quad f'(x) = 0$

2. $f(x) = kx \quad \Rightarrow \quad f'(x) = k$

3. $f(x) = x^n \quad \Rightarrow \quad f'(x) = nx^{n-1}$

4. $f(x) = \sqrt{x} \quad \Rightarrow \quad f'(x) = \dfrac{1}{2\sqrt{x}}$

5. $f(x) = \dfrac{1}{x} \quad \Rightarrow \quad f'(x) = \dfrac{-1}{x^2}$

6. $f(x) = e^x \quad \Rightarrow \quad f'(x) = e^x$

7. $f(x) = b^x \quad \Rightarrow \quad f'(x) = b^x \left(\ln b\right)$

8. $f(x) = \ln x \quad \Rightarrow \quad f'(x) = \dfrac{1}{x}$

9. $f(x) = \log_b x \quad \Rightarrow \quad f'(x) = \dfrac{1}{(\ln b)\, x}$

10. $f(x) = kg(x) \quad \Rightarrow \quad f'(x) = kg'(x)$

11. $f(x) = u(x) + v(x) \quad \Rightarrow \quad f'(x) = u'(x) + v'(x)$

12. $f(x) = u(x).v(x) \quad \Rightarrow \quad f'(x) = u'v + v'u$

13. $f(x) = \dfrac{u(x)}{v(x)} \quad \Rightarrow \quad f'(x) = \dfrac{u'v - v'u}{v^2}$

Rules of differentiation

1. $f(x) = f(u)$ *and* $u = u(x) \quad \Rightarrow \quad f'(x) = f'(u) \cdot u'$

2. $f(x) = u^n \quad \Rightarrow \quad f'(x) = nu^{n-1} \cdot u'$

3. $f(x) = \sqrt{u} \quad \Rightarrow \quad f'(x) = \dfrac{1}{2\sqrt{u}} \cdot u'$

4. $f(x) = \dfrac{1}{u} \quad \Rightarrow \quad f'(x) = \dfrac{-1}{u^2} \cdot u'$

5. $f(x) = e^u \quad \Rightarrow \quad f'(x) = e^u \cdot u'$

6. $f(x) = b^u \quad \Rightarrow \quad f'(x) = b^u (\ln b) \cdot u'$

7. $f(x) = \ln u \quad \Rightarrow \quad f'(x) = \dfrac{1}{u} \cdot u'$

8. $f(x) = \log_b u \quad \Rightarrow \quad f'(x) = \dfrac{1}{(\ln b)u} \cdot u'$