Differentiation Rules

From Section 3-4:

1. $\dfrac{d}{dx}(C) = 0$

2. $\dfrac{d}{dx}(x^n) = n\, x^{n-1}$

3. $\dfrac{d}{dx}(k\, f(x)) = k\, f'(x)$

4. $\dfrac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$

From Section 3-5:

5. $\dfrac{d}{dx}\big(F(x)\cdot S(x)\big) = F(x)S'(x) + F'(x)S(x)$

6. $\dfrac{d}{dx}\left(\dfrac{T(x)}{B(x)}\right) = \dfrac{B(x)T'(x) - T(x)B'(x)}{\big[B(x)\big]^2}$

From Section 3-6:

7. $\dfrac{d}{dx}\big(\big[f(x)\big]^n\big) = n\big[f(x)\big]^{n-1}f'(x)$

From Section 5-2:

8. $\dfrac{d}{dx}\left(e^x\right) = e^x$

9. $\dfrac{d}{dx}\left(\ln x\right) = \dfrac{1}{x}$

From Section 5-3:

10. $\dfrac{d}{dx}\left(e^{f(x)}\right) = e^{f(x)} f'(x)$

11. $\dfrac{d}{dx}\left(\ln\left(f(x)\right)\right) = \dfrac{1}{f(x)} f'(x) = \dfrac{f'(x)}{f(x)}$

Also from Section 5-3:

Let $a > 0$, $a \neq 1$

$$12. \frac{d}{dx}\left(a^x\right) = a^x \ln a$$

$$13. \frac{d}{dx}\left(\log_a x\right) = \frac{1}{x}\left(\frac{1}{\ln a}\right)$$

$$14. \frac{d}{dx}\left(a^{f(x)}\right) = a^{f(x)} f'(x) \ln a$$

$$15. \frac{d}{dx}\left(\log_a\left(f(x)\right)\right) = \frac{1}{f(x)} f'(x)\left(\frac{1}{\ln a}\right)$$