Perfect! Here’s a **comprehensive Black–Scholes Greeks cheat sheet** with **formulas, meanings, and intuition** all in one table:

**Black–Scholes Greeks Cheat Sheet**

| **Greek** | **Symbol / Formula** | **Interpretation / Intuition** |
| --- | --- | --- |
| **Delta** | (\Delta = \frac{\partial V}{\partial S} = N(d\_1)) (call) (\Delta = N(d\_1) - 1) (put) | How much the option price changes if the underlying stock moves by 1 unit. |
| **Gamma** | (\Gamma = \frac{\partial^2 V}{\partial S^2} = \frac{N'(d\_1)}{S \sigma \sqrt{T}}) | How Delta changes as the underlying changes; measures convexity of price vs stock. |
| **Vega** | (\text{Vega} = \frac{\partial V}{\partial \sigma} = S N'(d\_1) \sqrt{T}) | Sensitivity of option price to volatility; higher Vega → more volatile option price. |
| **Theta** | (\Theta\_{call} = -\frac{S N'(d\_1) \sigma}{2\sqrt{T}} - r K e^{-rT} N(d\_2)) (\Theta\_{put} = -\frac{S N'(d\_1) \sigma}{2\sqrt{T}} + r K e^{-rT} N(-d\_2)) | Sensitivity to time decay; how much value the option loses as time passes. |
| **Rho** | (\rho\_{call} = K T e^{-rT} N(d\_2)) (\rho\_{put} = -K T e^{-rT} N(-d\_2)) | Sensitivity to risk-free interest rate changes. |
| **Vanna** | (\text{Vanna} = \frac{\partial^2 V}{\partial S \partial \sigma} = -\frac{d\_2}{\sigma} \text{Vega}) | How Delta changes with volatility or Vega changes with stock price. |
| **Volga / Vomma** | (\text{Volga} = \frac{\partial^2 V}{\partial \sigma^2} = \text{Vega} \cdot \frac{d\_1 d\_2}{\sigma}) | How Vega changes as volatility changes; important for convexity of volatility. |
| **Charm** | (\text{Charm} = \frac{\partial \Delta}{\partial t} = -\frac{N'(d\_1) [2(r-q)T - d\_2 \sigma \sqrt{T}]}{2 T \sigma \sqrt{T}}) (call) | How Delta decays as time passes. |
| **Veta** | (\text{Veta} = \frac{\partial \text{Vega}}{\partial t}) | How Vega changes over time; measures time decay of volatility sensitivity. |
| **Speed** | (\text{Speed} = \frac{\partial \Gamma}{\partial S}) | How Gamma changes as the underlying changes. |
| **Zomma** | (\text{Zomma} = \frac{\partial \Gamma}{\partial \sigma}) | How Gamma changes as volatility changes. |
| **Color** | (\text{Color} = \frac{\partial \Gamma}{\partial t}) | How Gamma changes as time passes. |
| **Ultima** | (\text{Ultima} = \frac{\partial \text{Volga}}{\partial \sigma}) | How Volga changes with volatility; higher-order convexity in volatility. |

**🔍 Notes / Tips**

1. **N(d₁)** and **N(d₂)** come from Black–Scholes formulas:  
   [  
   d\_1 = \frac{\ln(S/K) + (r-q + \sigma^2/2)T}{\sigma \sqrt{T}}, \quad d\_2 = d\_1 - \sigma \sqrt{T}  
   ]
2. **N'(d₁) = \frac{1}{\sqrt{2\pi}} e^{-d\_1^2/2}** is the standard normal PDF.
3. **First-order Greeks (Delta, Vega, Theta, Rho)** are most commonly used.
4. **Second-order Greeks (Vanna, Volga, Charm, etc.)** are important for **hedging, risk management, and exotic options**.
5. All Greeks are usually **annualized**; divide by 365 for per-day effects.

If you want, I can also make a **visual diagram showing the “Greeks family tree”**: first-order vs second-order vs cross Greeks, which makes it much easier to memorize.

Do you want me to do that?