

# Maxwell's Equations

## in Plain Language:

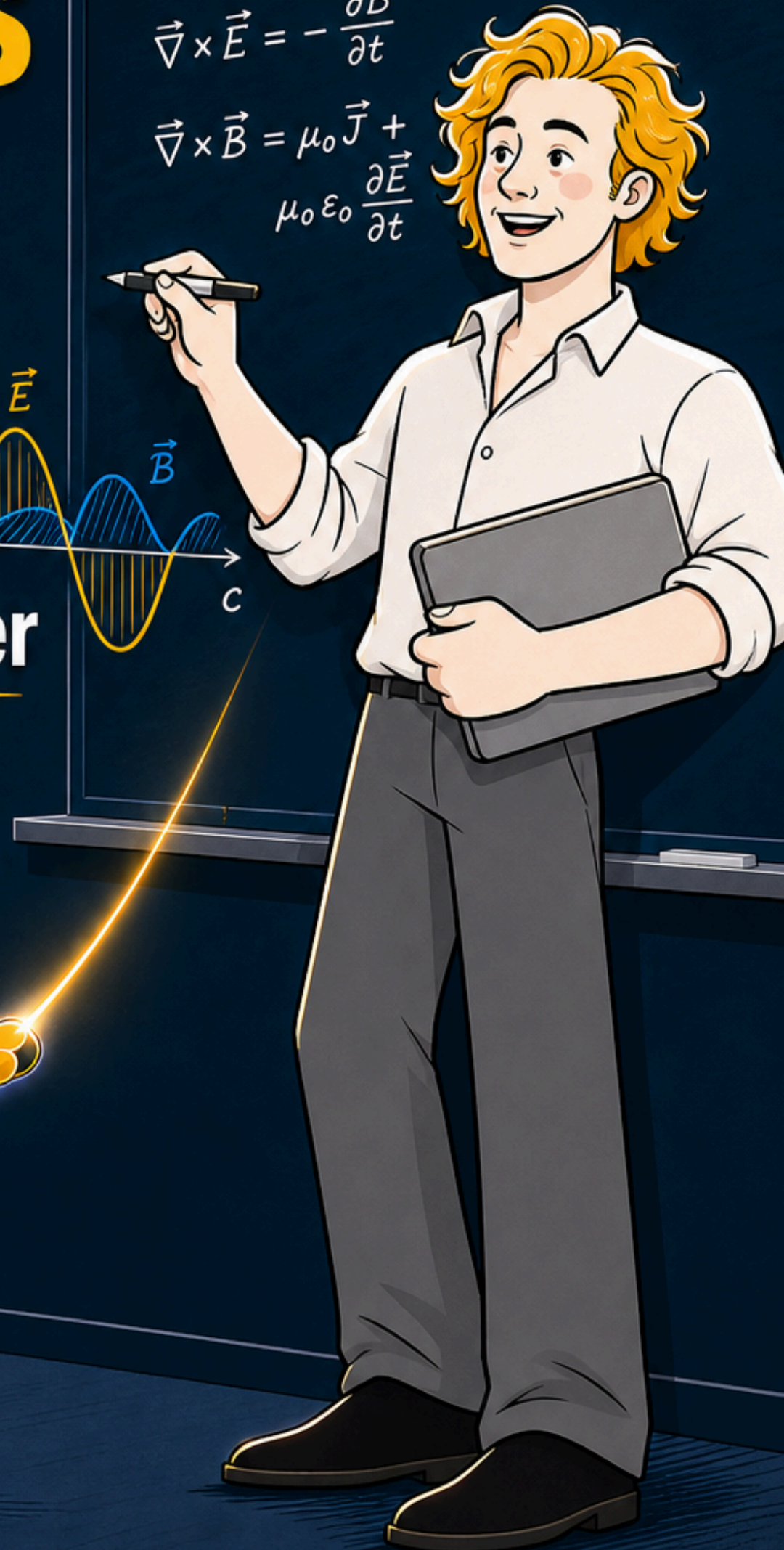
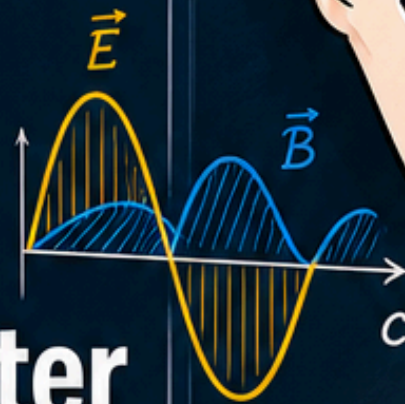
### What They Mean and Why They Matter

$$\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$$

$$\vec{\nabla} \cdot \vec{B} = 0$$

$$\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$$

$$\vec{\nabla} \times \vec{B} = \mu_0 \vec{J} + \mu_0 \epsilon_0 \frac{\partial \vec{E}}{\partial t}$$



# A quick note on fields before we start

Both electricity and magnetism involve invisible fields. A field is just a region of space where something exerts a force. You can't see a gravitational field, but you know it's there when you drop something. Electric and magnetic fields work the same way. They push and pull on charged particles, and Maxwell figured out the rules that govern them.

**With that in mind, here are the four equations.**



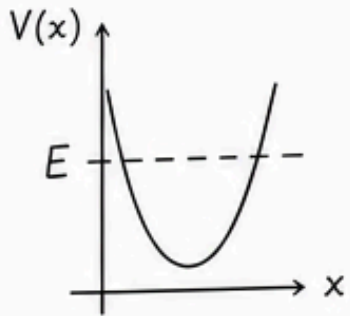
# EQUATION 1:

Electric field lines start from charges  
and end on charges

(Gauss's Law for Electricity)

$$\mathcal{L} = \frac{1}{2} m \dot{x}^2 - V(x)$$

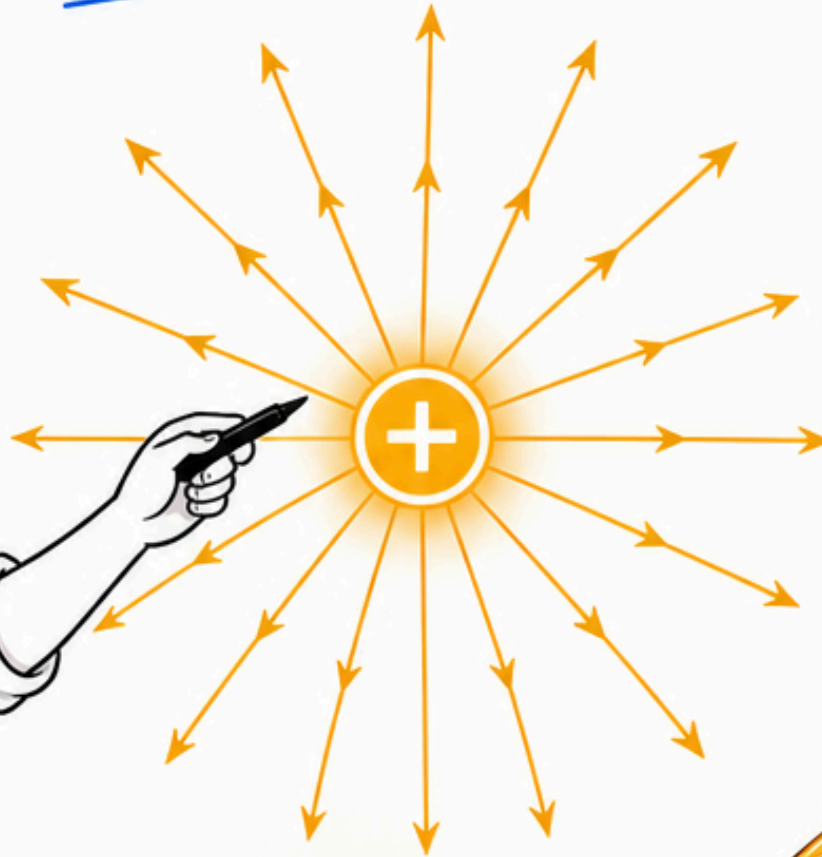
$$\frac{d}{dt} \left( \frac{\partial \mathcal{L}}{\partial \dot{x}} \right) - \frac{\partial \mathcal{L}}{\partial x} = 0$$



$$\Psi(x,t) = Ae^{i(kx - \omega t)}$$



Field lines start  
on positive charges  
and end on  
negative charges.



$$\Phi_E = \oint \vec{E} \cdot d\vec{A}$$
$$= \frac{Q_{\text{enclosed}}}{\epsilon_0}$$



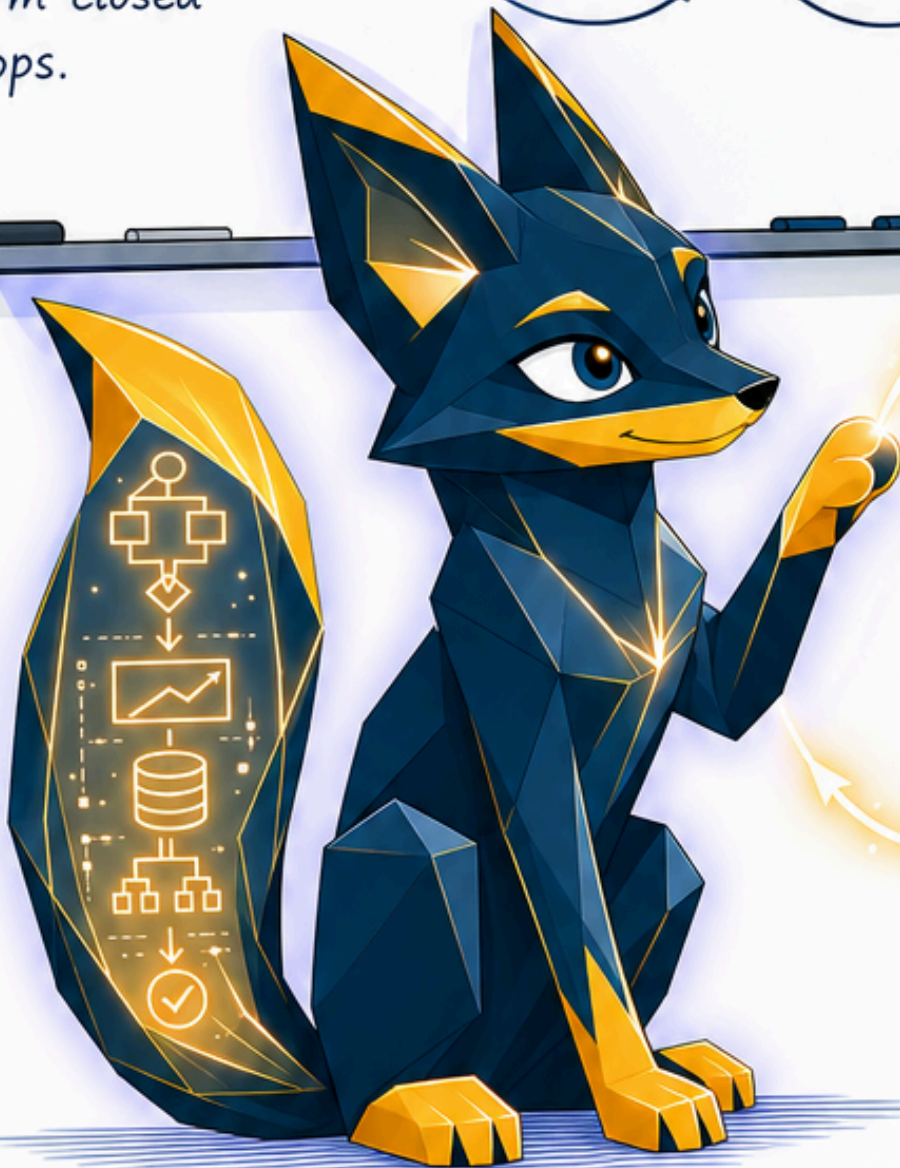
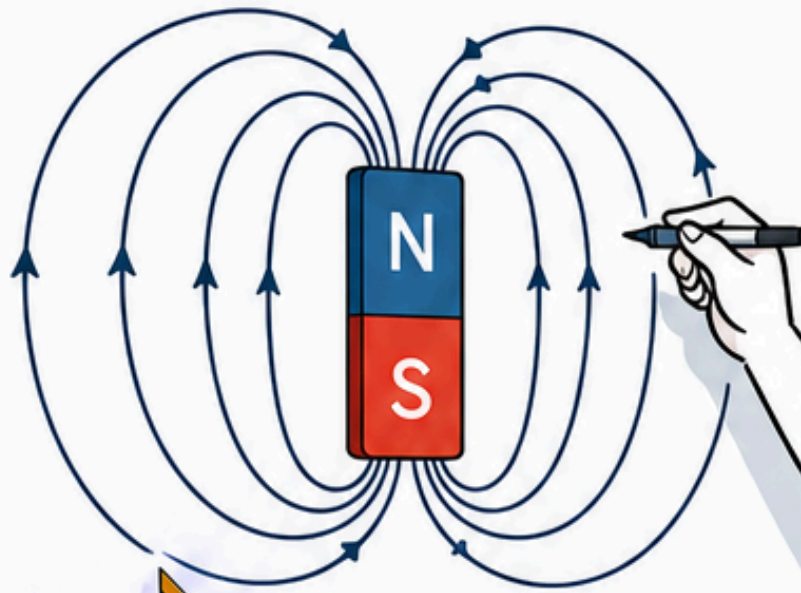
# Equation 2: Magnetic field lines have no beginning and no end

(Gauss's Law for Magnetism)

$$\nabla \cdot \vec{B} = 0$$

Gauss's Law  
for Magnetism

No magnetic  
monopoles.  
Field lines  
form closed  
loops.



## Equation 3:

# A CHANGING MAGNETIC FIELD CREATES AN ELECTRIC FIELD (FARADAY'S LAW)

$$\mathcal{E} = - \frac{d\Phi_B}{dt}$$

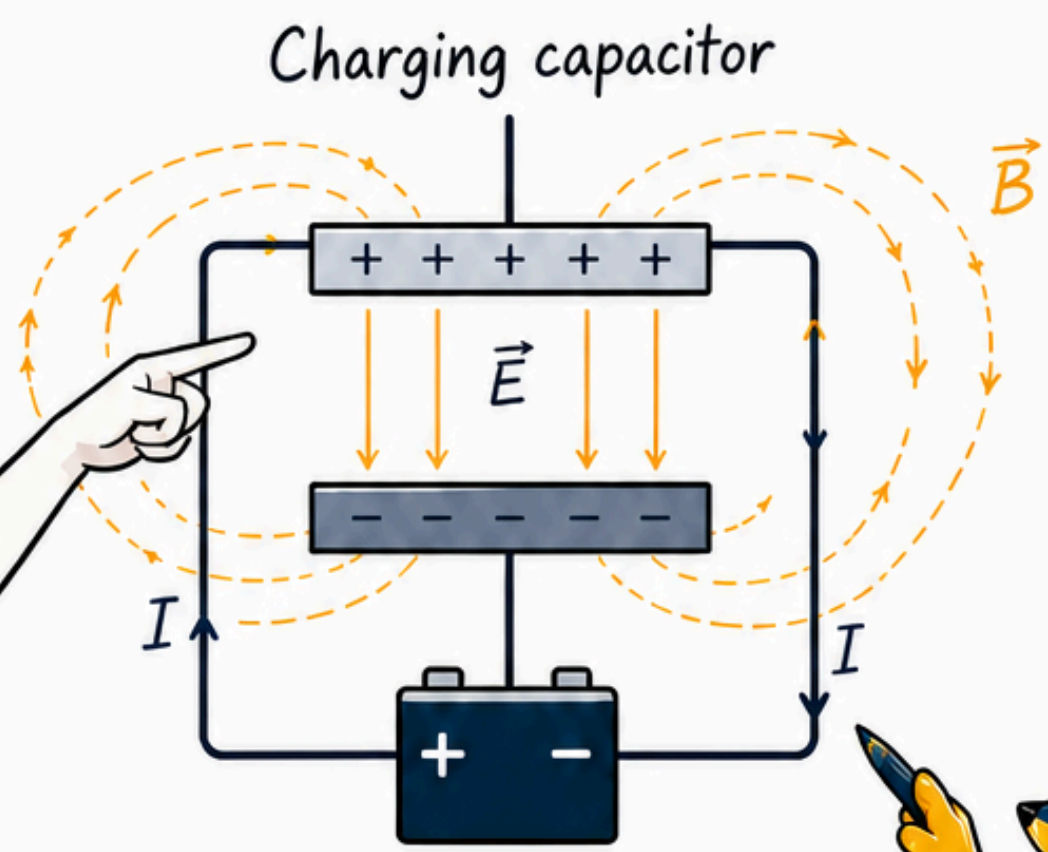


$\mathcal{E}$   
(curling  
electric  
field)

Changing  $\Phi_B$   
→ induced  $\mathcal{E}$   
→ current

# Equation 4:

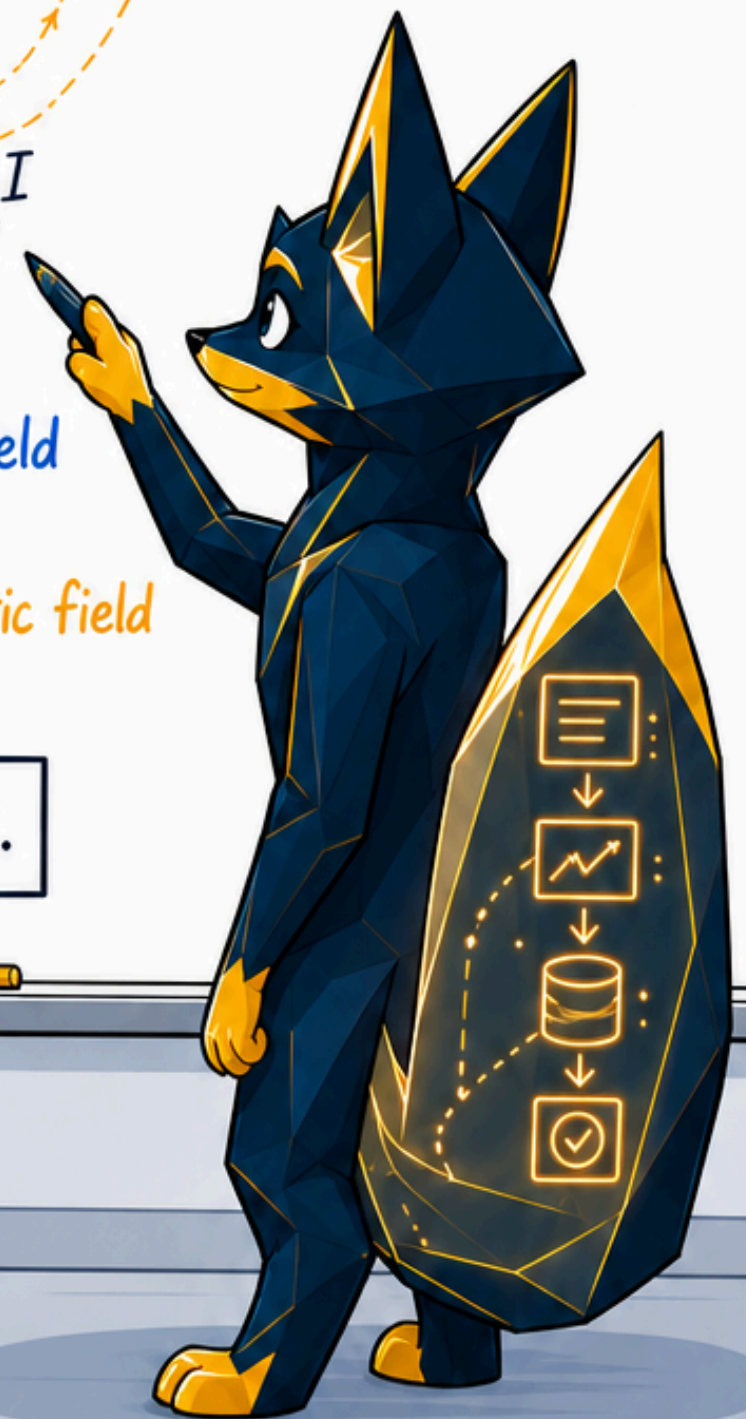
Moving charges and changing electric fields both create magnetic fields  
(Ampère's Law, with Maxwell's key addition)

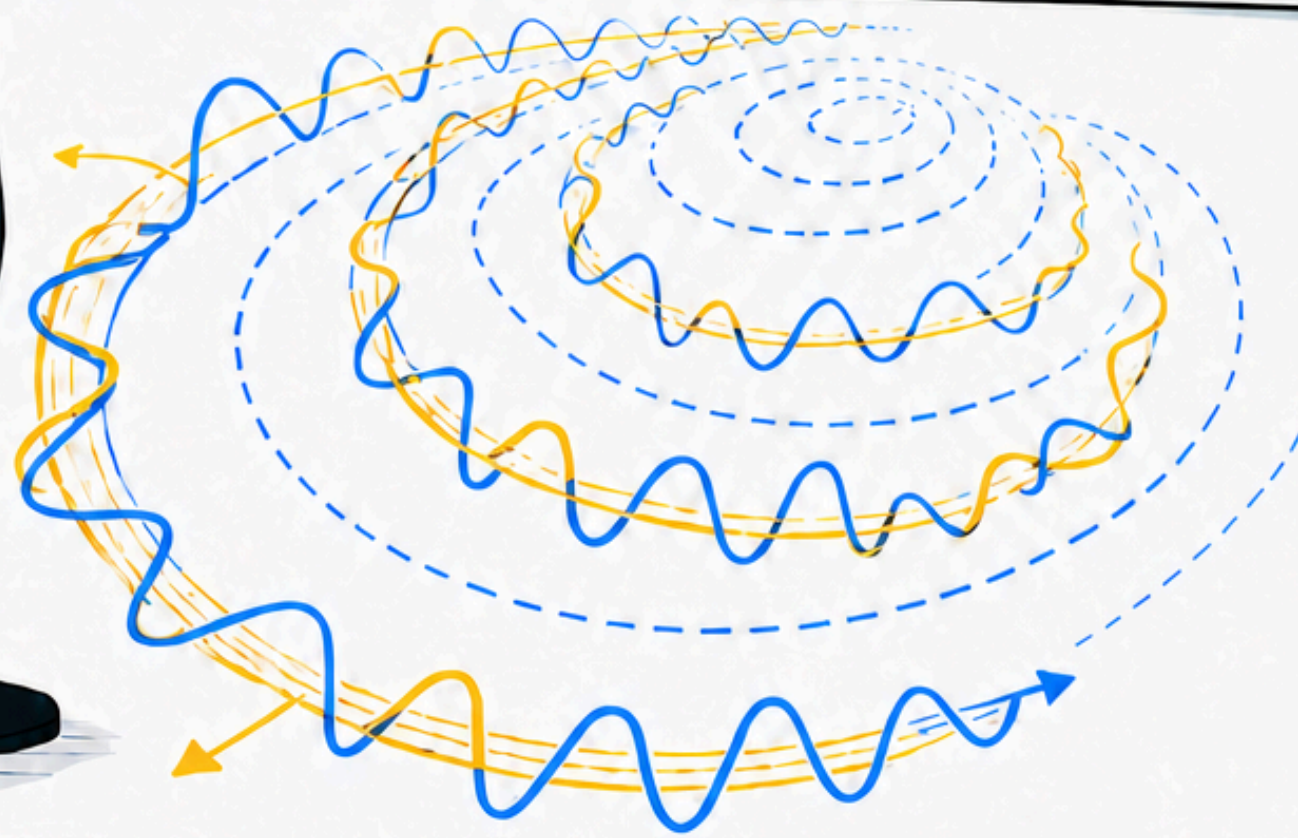
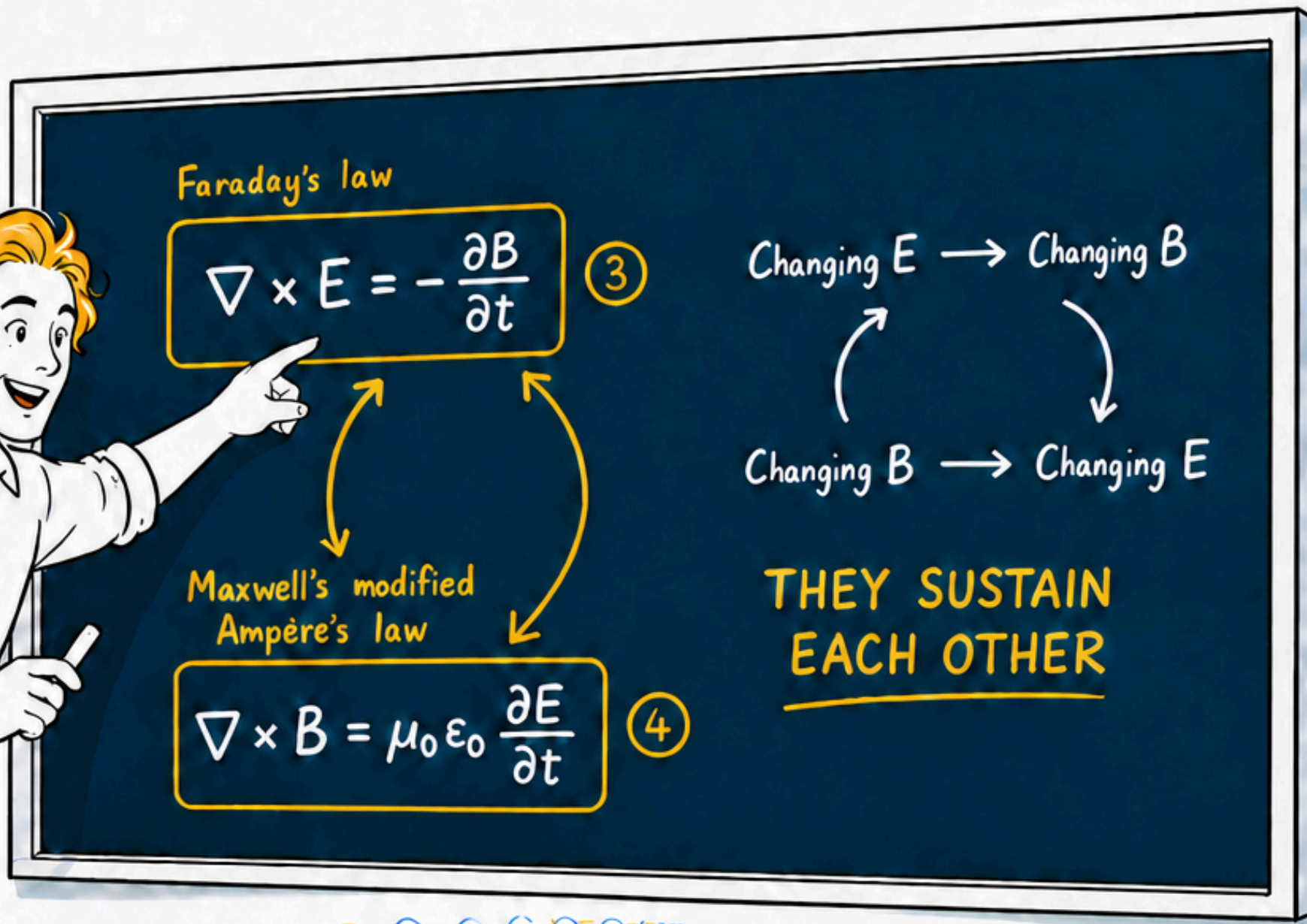


Moving charges  $\longrightarrow$  Magnetic field  
(real current)

Changing electric field  $\longrightarrow$  Magnetic field  
(Maxwell's addition)

Together: they unlock EM waves.





light

**WAVES THAT NEED NOTHING BUT SPACE.**

**SPEED ≈ 300,000 KM/S**

# What all of this makes possible: a thorough list

Maxwell's equations aren't historical curiosities. They're working engineering tools, used every day across every sector that touches electricity, light, or magnetism. Here's a thorough account of where they show up.



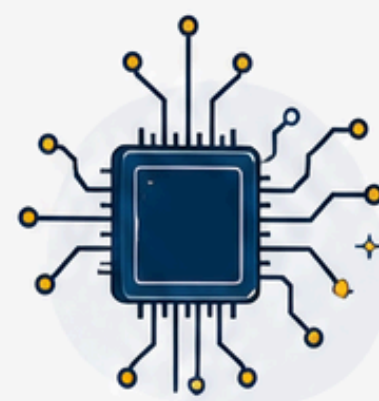
Telecommunications and wireless technology



Power generation and electrical infrastructure



Medical imaging and diagnostics



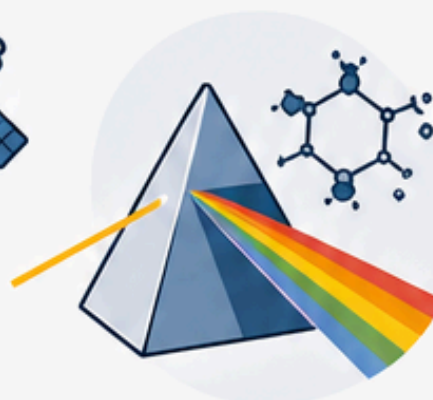
Computing and electronics



Transport and navigation



Astronomy, climate, and earth sciences



Materials science and optics



Defence and aerospace



# Explaining complex terms is exactly the problem we solve

If you're an IR lead, a founder preparing for a Series A, or a CMO trying to explain a quantum product to enterprise buyers, the challenge isn't understanding the technology.

**It's compressing it into a narrative that lands in 60 seconds without losing the technical truth.**

That's what we do at Infrairis. We work with deep tech companies across ANZ to turn complex products into clear, professional explainer videos in 2-3 weeks — directed by people who have shipped tech themselves.

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