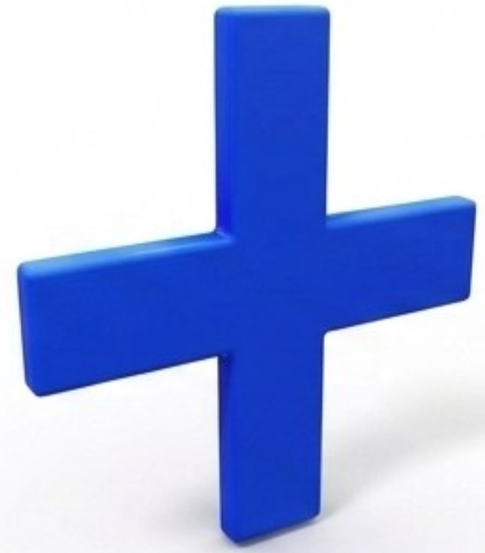
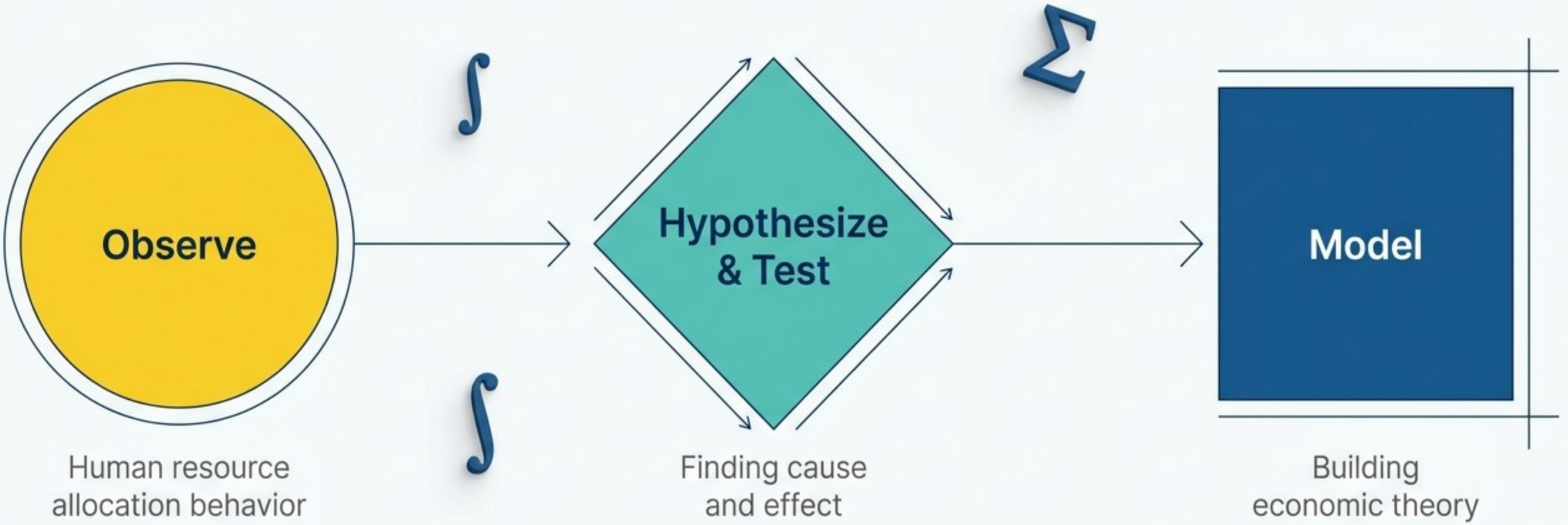
The Language of Clarity.

Mathematical Economics (BEC2117) | ECON SSRU | A.OAD



The Goal of Economic Theory



To satisfy curiosity, explain complex economic systems, and accurately predict the impact of human behavior.

Descriptive (Words)

Prone to Confusion

Relies on narrative. Good for intuition, but easily creates misunderstandings as systems grow complex.

Graphical (Charts)

Clear, but Limited

Reveals exact relationships between variables, but visually breaks down past 2 or 3 dimensions.

Mathematical (Equations)

Infinitely Scalable

The ultimate tool. Allows multiple variables to interact with precise definitions and logic.

The Mathematical Advantage

> 3 Variables

Mathematics is the only language that allows economists to clearly define and analyze systems where three, four, or dozens of variables interact simultaneously.

Equilibrium (Statics)

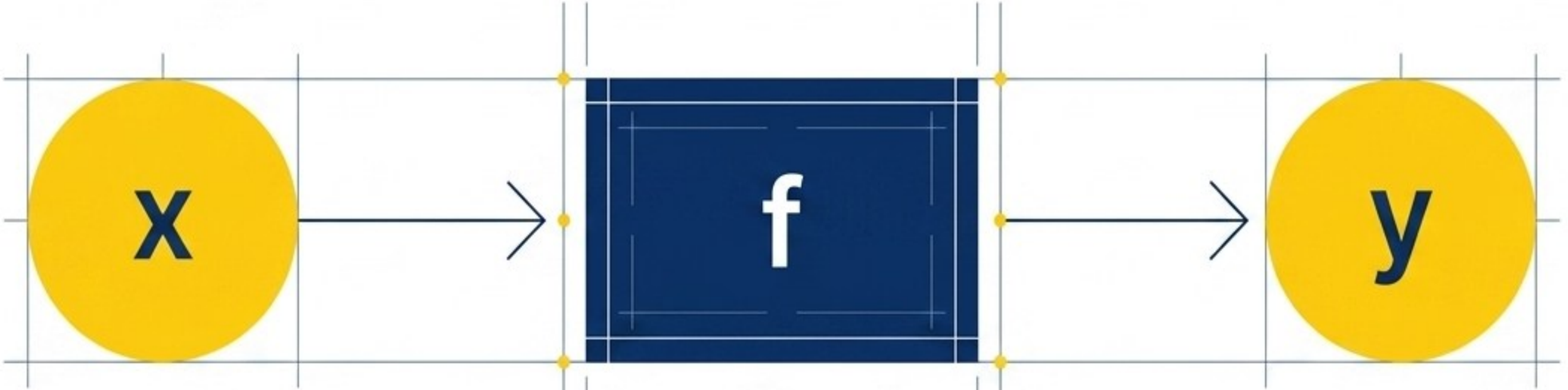
Analyzing a state of rest. (e.g., Market Equilibrium, Consumer/Production Balance).

Movement over Time (Dynamics)

Analyzing economic variables bound by sequence and time. The index t dictates the order of events.

The Engine of Economics: The Function

$$y = f(x)$$



Independent Variable:
The given behavior/condition

The Function:
The rule of transformation, a strict 1:1 relationship

Dependent Variable:
The resulting economic outcome

'y is a function of x.' A specific value of x is transformed into a specific value of y.

Scaling the Complexity

$$y = f(x)$$

One dependent, one independent.

$$y = f(x_1, x_2)$$

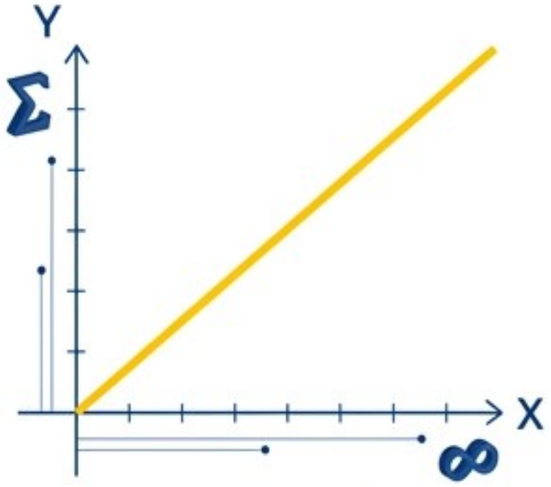
Adding complexity.

$$y = f(x_1, x_2, \ldots, x_n)$$

Infinite scalability to n variables.

The Taxonomy of Behavior

Linear Function

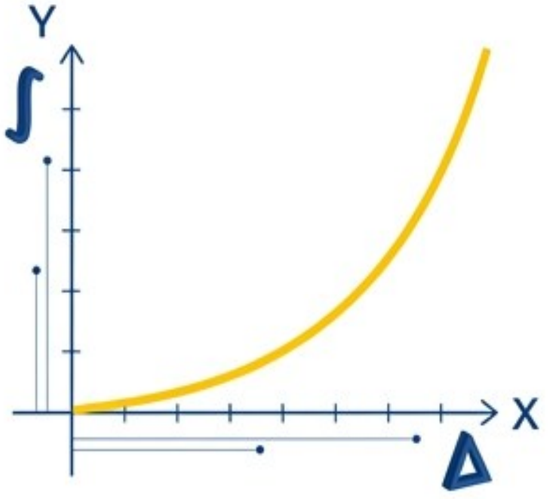


$$y = a + bx$$

(where a is constant, b is the slope/coefficient)

$$y = b_{-0} + b_{-1}x_1 + b_{-2}x_2 + \ldots + b_{-n}x_n$$

Non-Linear Function



Quadratic, Power, and Logarithmic models that capture the shifting realities of human behavior (e.g., diminishing returns).

Quadratic Function

$y = ax^2 + bx + c = 0$

$x = (-b \pm \sqrt{(b^2 - 4ac)}) / 2a$

Power Function (Cobb-Douglas)

$y = Ax^b$

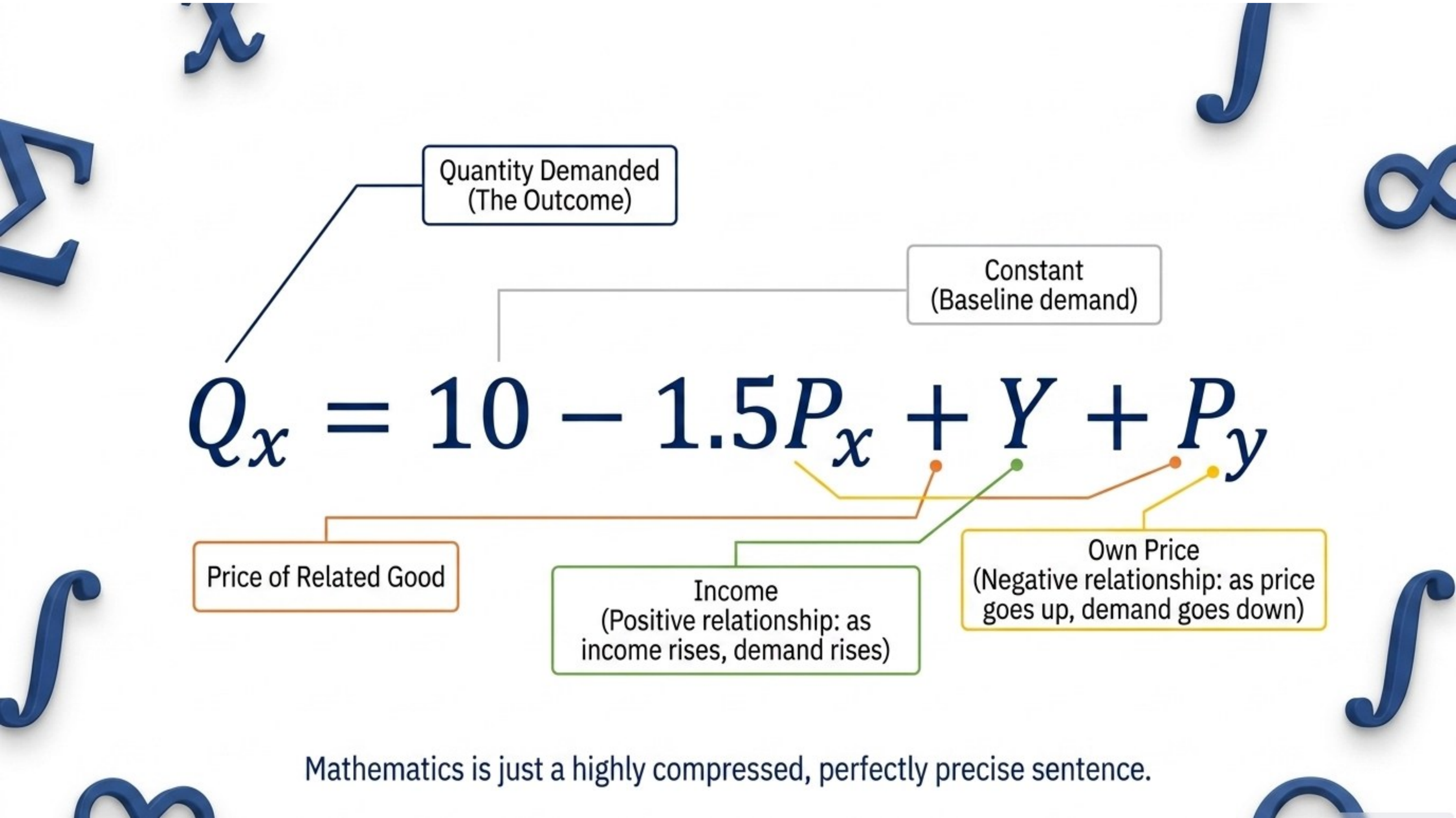
$X = aY^\alpha Z^\beta$

The foundation of modern production and utility models.

Logarithmic Function

$\log y = \log a + b \log x$

Used to transform complex, curved power functions into straight lines for easier analysis.



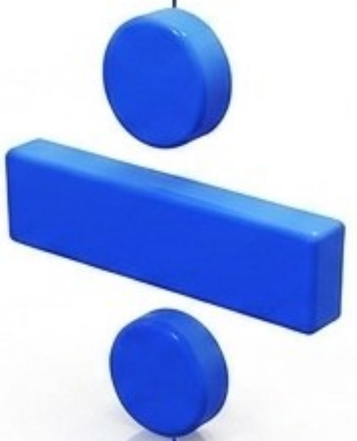
Mathematics is just a highly compressed, perfectly precise sentence.

Utility Function

$$U = x^{\alpha} y^{\beta}$$

Measuring the satisfaction derived from consuming two goods (x and y).

$\alpha, \beta > 0$ and $0 < \alpha, \beta < 1$



Production Function

$$Q = K^{\alpha} L^{\beta}$$

Measuring the output generated by combining two inputs (Capital K and Labor L).

$\alpha, \beta > 0$ and $0 < \alpha, \beta < 1$

One mathemnatical blueprint.
Two completely different economic behaviors.

You now have the blueprint.

We are going to have a great year learning together.