Linear Algebra

Part 1. Linear Algebra

Part 2. Linear Programming

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Linear Equation is the equation in which

- Variables are multiplied by constants and summed
- No variables are multiplied together
- No powers of variables greater than one, no fractional or negative powers
- No roots, logarithms, exponents, trigonometric and other expressions of the variables

Linear equation in two variables x and y describes the straight line on the xy-plane

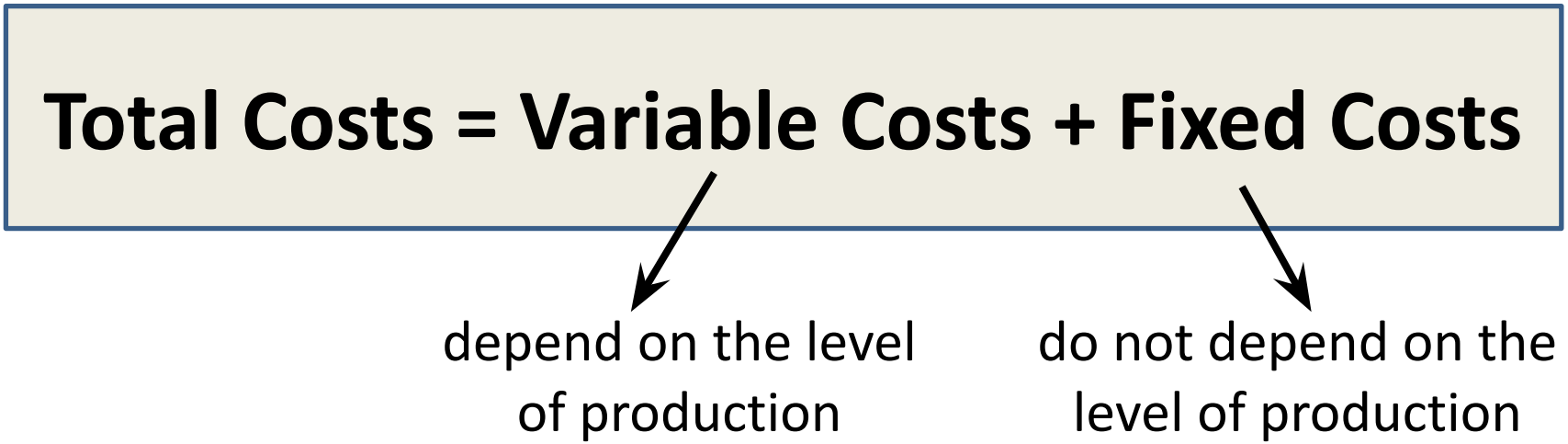
Name of the form	Equation	Given
Point-slope form	$y - y_1 = m(x - x_1)$	slope m, point (x_1, y_1)
Slope-intercept form	$y = mx + b$	slope m, b - y-intercept
Two-point form	$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$	points (x_1, y_1) (x_2, y_2)
Intercept form	$\frac{x}{a} + \frac{y}{b} = 1$	a - x-intercept b - y-intercept
General form	$Ax + By + C = 0$	A and B are not both 0
Horizontal line	$y = b$	
Vertical line	$x = a$	

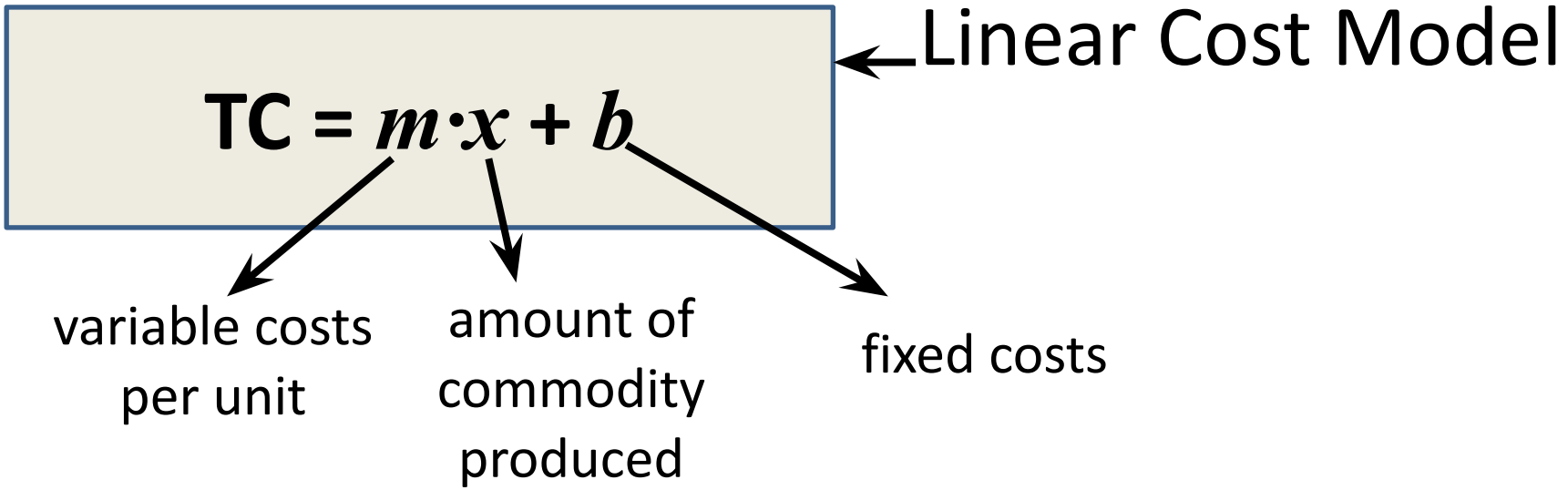
Parallel and perpendicular

- Two straight lines with slopes m_1 and m_2 are *parallel* if $m_1 = m_2$.
- Two straight lines with slopes m_1 and m_2 are *perpendicular* if $m_1 m_2 = -1$.

Applications to business and economics

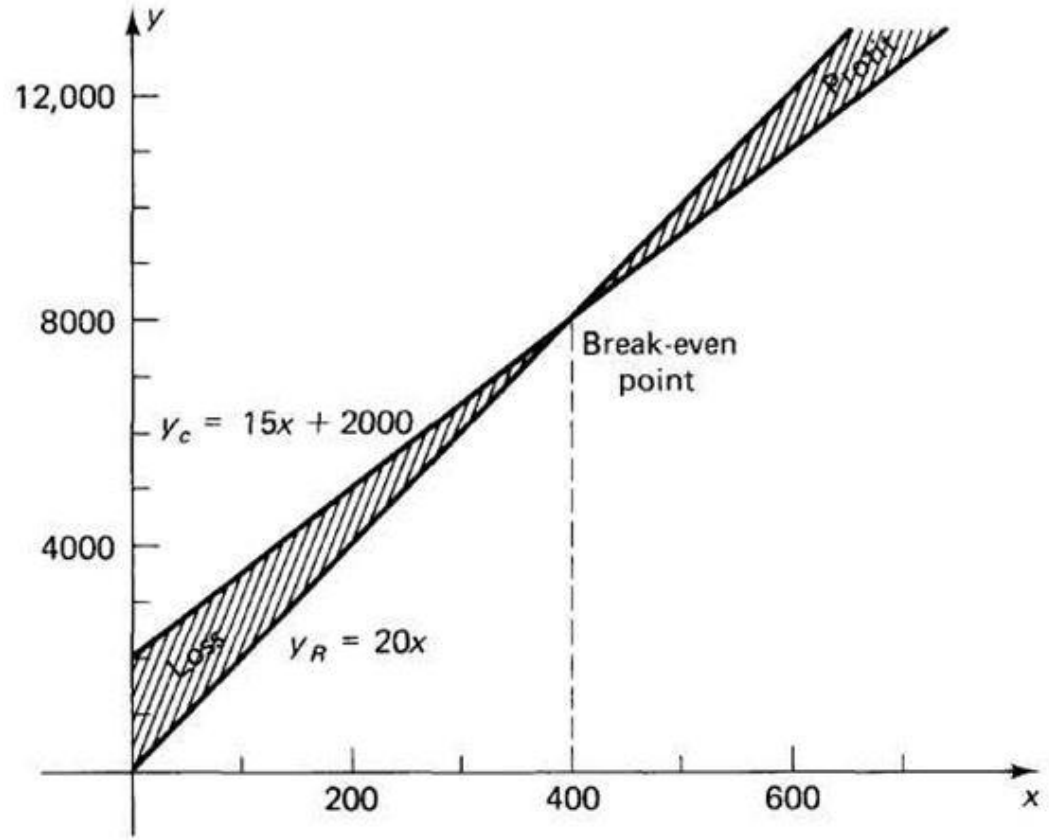
Linear Cost Model





Break-even Analysis

- If TC > TR ⟶ a loss
- If TC < TR ⟶ a profit
- If TC = TR ⟶ no loss and no profit



Supply and Demand

- **Law of Supply** - a relation specifying the amount of any commodity that manufacturers (or sellers) can make available in the market at various prices.
- **Law of Demand** - a relationship that specifies the amounts of a particular commodity that consumers are willing to buy at various price levels.

Linear Supply and Demand Laws

- S: $p = m_S x + b_S$
- D: $p = m_D x + b_D$

x – amount of commodities

p – price for one commodity