

MARGINALS AS THE  
DERIVATIVES OF  
FUNCTIONS.  
HOW ENTREPRENEURS  
SHAPE THE ECONOMY.

# What do “*Marginal value*” means?

It's the change in a dependent variable associated with a 1-unit change in an independent variable. Consider the general function  $Y = f(X)$ . Using  $\Delta$  to denote change, it's possible to express the change in the value of the independent variable,  $X$ , by the notation  $\Delta X$  and the change in the dependent variable,  $Y$ , by  $\Delta Y$ .

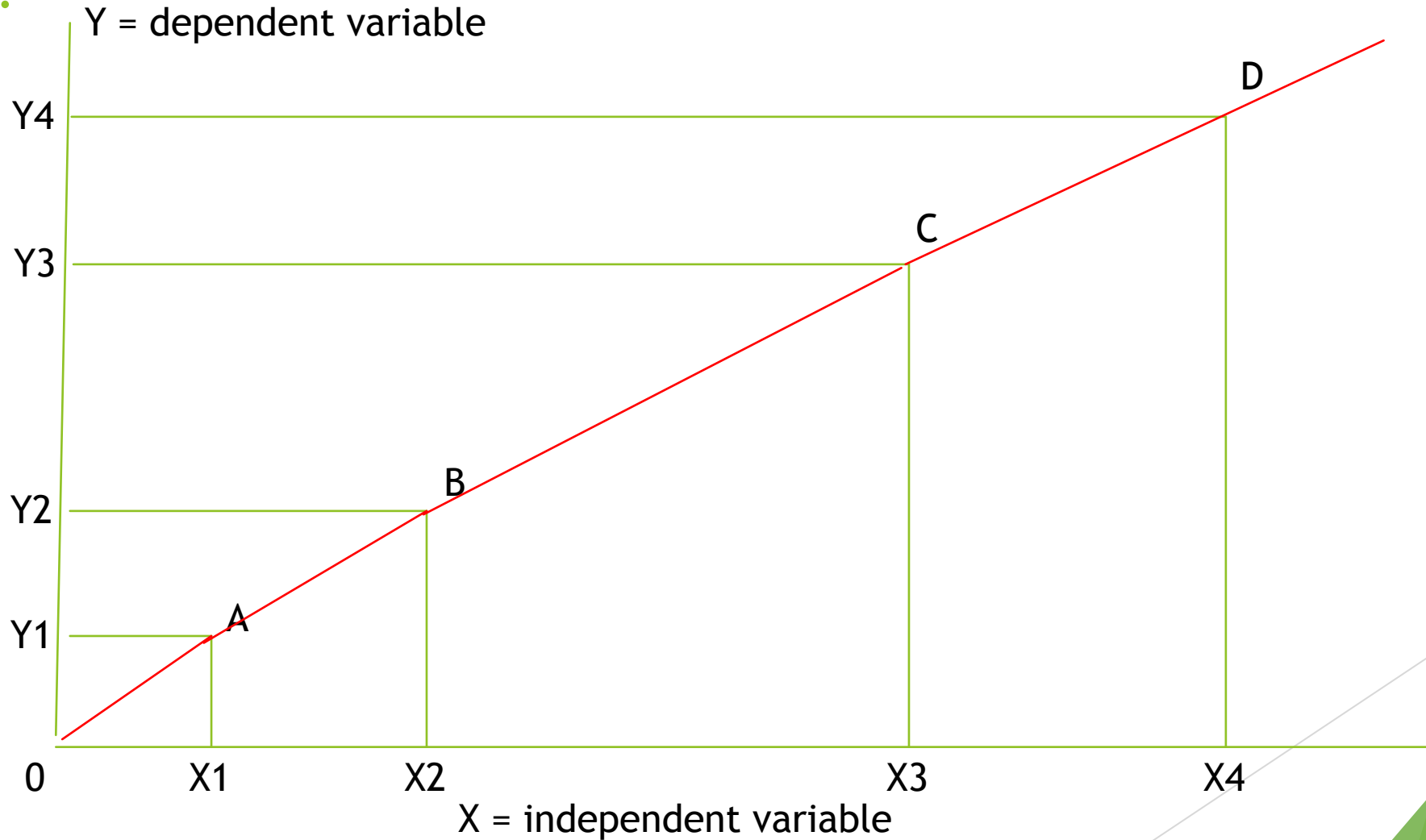
*The term “marginal”* is especially common in economics. The sorts of marginal values most common to economic analysis are those associated with unit changes of resources.

The ratio  $\Delta Y/\Delta X$  is a general specification of the marginal concept:

$$\text{Marginal } Y = \frac{\Delta Y}{\Delta X}$$

The change in  $Y$ ,  $\Delta Y$ , divided by the change in  $X$ ,  $\Delta X$ , indicates the change in the dependent variable associated with a 1-unit change in the value of  $X$ .

**Figure 2.3** Changing  $\Delta Y/\Delta X$  over the Range of a Curve. The ratio  $\Delta Y/\Delta X$  changes continuously along a curved line.



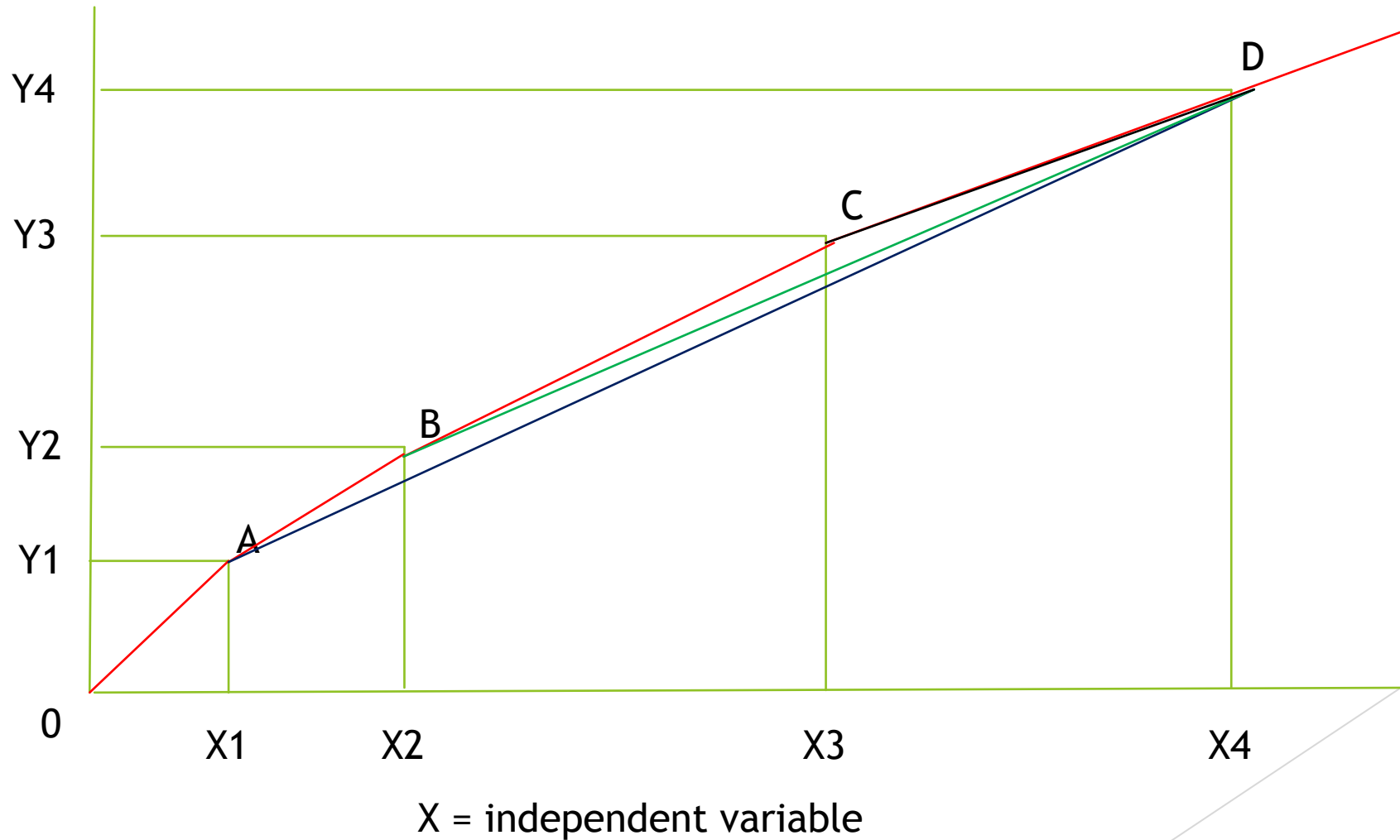
## What is “*derivative*” ?

It's a precise specification of the marginal relation. Finding a derivative involves finding the value of the ratio  $\Delta Y/\Delta X$  for extremely small changes in  $X$ . The mathematical notation for a derivative is the following:

$$\frac{dY}{dX} = \frac{\textit{limit}}{\Delta X \rightarrow 0} = \frac{\Delta Y}{\Delta X}$$

The derivative of  $Y$  with respect to  $X$  equals the limit of the ratio  $\Delta Y/\Delta X$ , as  $\Delta X$  approaches zero. This concept of the derivative as the limit of a ratio is precisely equivalent to the slope of a curve at a point.

*Figure 2.4* A derivative as the slope of a curve. The derivative of  $Y$  with respect to  $X$  identifies the slope of a curve.  $Y$  = dependent variable



# Derivatives and Slope

Notice that in Figure 2.4 the average slope of the curve between points A and D is measured as

$$\frac{\Delta Y}{\Delta X} = \frac{Y_4 - Y_1}{X_4 - X_1}$$

And is the slope of the chord connecting the two points. Similarly, the average slope of the curve can be measured over smaller and smaller intervals of X, such as those connecting points B and C with D. At the limit, as  $\Delta X$  approaches zero, the ratio  $\Delta Y/\Delta X$  is equal to the slope of a line drawn tangent to the curve. The slope of this tangent is defined as the derivative,  $dY/dX$ , of the function at point D; it measures the marginal change in Y associated with a very small change in X at that point.

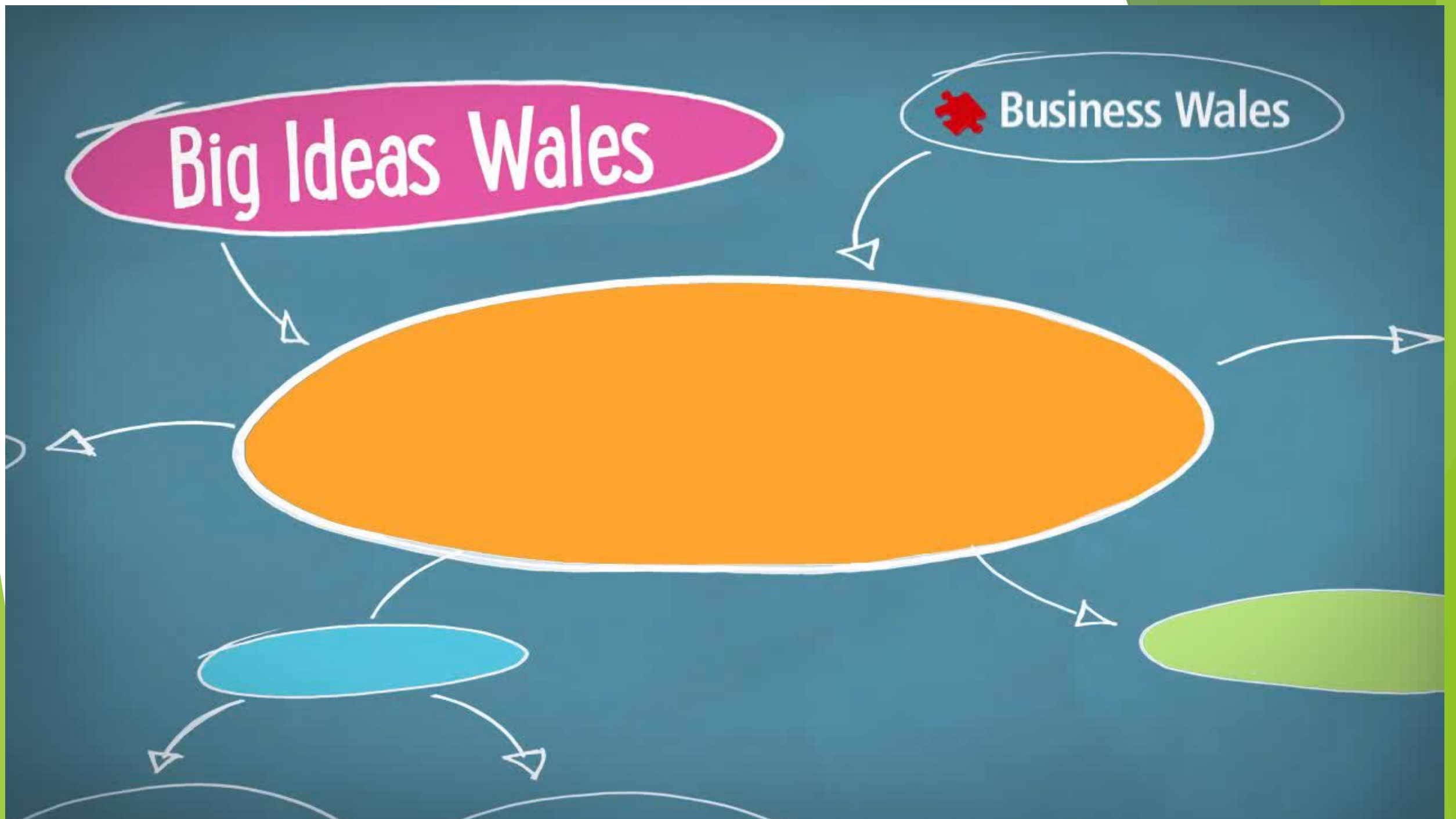
The derivative  $dY/dX$  shows precisely how revenue and output are related at a specific output level. Because the change in revenue associated with a change in output is defined as *marginal revenue*, the derivative of total revenue is precise measure of marginal revenue at any specific output level. A similar situation exists for total cost: The derivative of the total cost function at any output level indicates *marginal cost* at that output.



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Firms often are started by a single individual with no more than an idea for a better product or service – entrepreneur. The word “*entrepreneur*” taken from the Old French word “*entreprendre*”, meaning “*to undertake*”, the term refers to one who organizes, operates and assumes the risk of a business venture.

As a catalyst, the entrepreneur brings economic resources together in the risky attempt to meet customer needs and desires. This process often leads to failure – in fact, the odds against success are long. Seldom do more than 1 in 10 start-up businesses enjoy even minimal economic success. Even those select few that see their product or service reach a national market find stable long-term success elusive.

As entrepreneurs create new opportunities, they destroy the old way of doing things. Entrepreneurship plays an important role in what economist Joseph Schumpeter called *“the creative destruction of capitalism”* – the process of replacing the old with the new, and the inefficient with the efficient.

The opportunity for wealth is surely an important motivation, the impact and recognition that come with creating a truly unique good or service often are equally important to entrepreneurs. Whatever the motivation, entrepreneurs play a key role in our economy.



*Thank you for attention!*