The farther a curve is zoomed in, the closer to a line it looks, justifying methods of approximating the value of by using a line. This section shows how to calculate relative errors from such a *linear approximation*.

# Linear Approximations

Linear Approximation, Tangent Line Approximation, Linearization (*object*) – a line that approximates values of for values of near a certain domain value .

Given a function , the linearization of at would be . Figure 1 illustrates this.

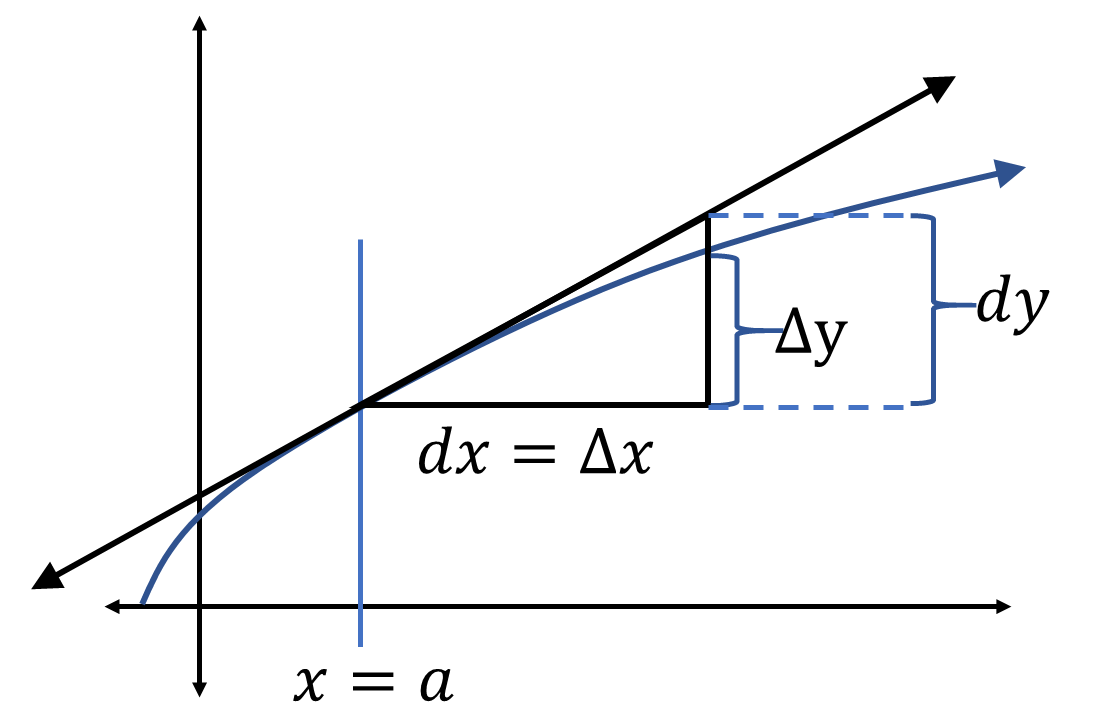
Notice that as approaches , approaches .

Figure

# Differentials

Differential (*object*) – a measure of change (difference) in a variable. Examples: , , . See Figure 2.

Figure

The past sections have put differentials into ratios to define . Now, separating them with algebra:

Therefore,

Put into a triangle, is the change in the linearization, but is the change in the curve. Figure 3 diagrams this.

Figure

Since and , then can be a measurement of possible error given a known that means the error possible of .

Relative error (*measure*) – the possible error in a variable divided by the variable.

Percentage error (*measure*) – the relative error expressed as a percentage.

# What Did You Learn?

* What is a linearization of a function?
* How do derivatives define linear approximations?
* Why does measure possible error for a given possible error of ?