Composed Difference

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Introduction

A composed difference is a function 'h' that equals the difference in value of a function 'g' after transforming the argument with a function 'f'. We write down the 3 functions as a tuple with 3 values.

$$h(x)=g(f(x))-g(x)$$
$$(f(x), g(x), h(x))$$

It is useful to think of the tuple as a set. The most general set is:

$$(f(x), g(x), g(f(x))-g(x))$$

If 'g' is a linear function, then we have:

$$(f(x), g(x), g(f(x)-x))$$

If 'f' is adding an infinitesimal, we get information about the derivative in 'h':

$$\epsilon^2=0$$
$$(x+\epsilon, g(x), g'(x)\epsilon)$$

Invariants

The square function is symmetric because there is does not matter wether we change the sign:

$$(-x, x^2, 0)$$

The general invariant set is given by:

$$(f(x), g(x), 0)$$

When 'f' is identity, we have:

$$(x, g(x), 0)$$

Any constant 'c' added to 'g' remains invariant:

$$(f(x), g(x)+c, 0)$$

For a quadratic function in standard form we have an additional invariant to identity:

$$(-(\frac{a_1}{a_2}+x), a_0+a_1 x+a_2 x^2, 0)$$

In factored form we have:

$$(b_0+b_1-x, (x-b_0)(x-b_1), 0)$$

This leads to the connection:

$$\frac{a_1}{a_2}+b_0+b_1=0$$