Transformations 2

Introduction

When I worked in "Satellite Mission Analysis" the mantra was always "The sun revolves around the earth. It makes the maths easier".

What we were doing was transforming the whole coordinate system to keep the earth fixed and have the sun - and the rest of the universe for that matter - revolve around us. As we were just analysing the orbits of earth bound satellites, that made complete sense.

Mathematics

Suppose we plot $f(x) = (x - 4)^2 + 5$.

We observe a quadratic curve with a minimum at coordinate (4 , 5).

But why does the asymmetry between 4 and 5 occur in the original expression?

Why does +5 dutifully move the curve up but we need to insert –4 to move the curve to the right?

Consider the transformations necessary to move the coordinate system 5 units down and 4 units to the left.

To move the **x-coordinate** down we adjust the **y value** because we're changing where x intersects the y-axis.

$y \Rightarrow y - 5$ moves x-axis down

To move the **y-coordinate** right we adjust the **x value** because we're changing where y intersects the x-axis.

$x \Rightarrow x - 4$ moves y-axis to the left

Insert these transformations into $y = x^2$

$\Rightarrow y - 5 = (x - 4)^2$ which rearranged gives $y = (x - 4)^2 + 5$

which is the required result. ⌓ *Robert Goodhand*

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