

8.2: Function of Endpoint Time

What about the action as a function of the final point *arrival time*?

Since *[Math Processing Error]*, the value of the Lagrangian at the endpoint. Remember we are defining the action at a point as that from integrating along the true path up to that point.

Landau denotes *[Math Processing Error]*

and we'll be doing this, but it's crucial to keep in mind that the *endpoint* position and time are the variables here!

If we now allow an incremental time increase, *[Math Processing Error]*, with the final coordinate position as a free parameter, the dynamical path will now continue on, to an incrementally different finishing point.

This will give (with t understood from now on to mean *[Math Processing Error]*

[Math Processing Error]

Putting this together with *[Math Processing Error]* gives immediately the partial time derivative

[Math Processing Error]

and therefore, combining this with the result *[Math Processing Error]* from the previous section,

[Math Processing Error]

This, then, is the total differential of the action as a function of the spatial and time coordinates of the end of the path.

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