A sample presentation

With ramblings from a madman

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Title

The quick brown fox jumps over the lazy dog [1].

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$$\boxed{i\hbar\partial_t \left|\Psi\right\rangle = \hat{\mathrm{H}} \left|\Psi\right\rangle} \tag{1}$$

What

What

- One.

What

- One.
- Two.

What

- One.
- Two.
- Three.

The state of the world

Theorem 1.1: Birb

Birbs exist.

Colorbox test

A very important result.

A test of what the box environment looks like

This is the fundamental theorem of calculus:

$$\int_a^b f(t)\,\mathrm{d}t = F(b) - F(a) \tag{2}$$

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Notice:

- thing to say;
- another thing to say;
- consider $\mathbf{F} = m\ddot{\mathbf{x}}$.

A simple derivation

Extremization of the action entails:

$$\boxed{0 = \delta\mathcal{S}} = \int_{t_i}^{t_f} \mathrm{d}t\,\delta\mathcal{L}$$

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$$\begin{aligned}\boxed{0 = \delta\mathcal{S}} &= \int_{t_i}^{t_f} \mathrm{d}t\,\delta\mathcal{L} \\ &= \int_{t_i}^{t_f} \mathrm{d}t \left[\frac{\delta\mathcal{L}}{\delta q}\delta q + \frac{\delta\mathcal{L}}{\delta\dot{q}}\delta\dot{q}\right]\end{aligned}$$

A simple derivation

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$$
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&= \int_{t_i}^{t_f} \mathrm{d}t \left[\frac{\delta\mathcal{L}}{\delta q}\delta q + \frac{\delta\mathcal{L}}{\delta\dot{q}}\delta\dot{q}\right] \\
&= \int_{t_i}^{t_f} \mathrm{d}t \left[\frac{\delta\mathcal{L}}{\delta q} - \frac{\mathrm{d}}{\mathrm{d}t}\frac{\delta\mathcal{L}}{\delta\dot{q}}\right]\delta q + \underbrace{\int_{t_i}^{t_f} \mathrm{d}t \frac{\mathrm{d}}{\mathrm{d}t}\left(\frac{\delta\mathcal{L}}{\delta\dot{q}}\delta q\right)}_{\text{vanishes (B.C.s)}}
\end{aligned}
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&\Rightarrow \boxed{\frac{\delta\mathcal{L}}{\delta q} - \frac{\mathrm{d}}{\mathrm{d}t}\frac{\delta\mathcal{L}}{\delta\dot{q}} = 0}
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$$

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Extremization of the action entails:

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$$= \int_{t_i}^{t_f} \mathrm{d}t \left[\frac{\delta \mathcal{L}}{\delta q} \delta q + \frac{\delta \mathcal{L}}{\delta \dot{q}} \delta \dot{q} \right]$$
$$= \int_{t_i}^{t_f} \mathrm{d}t \left[\frac{\delta \mathcal{L}}{\delta q} - \frac{\mathrm{d}}{\mathrm{d}t} \frac{\delta \mathcal{L}}{\delta \dot{q}} \right] \delta q + \underbrace{\int_{t_i}^{t_f} \mathrm{d}t \frac{\mathrm{d}}{\mathrm{d}t} \left(\frac{\delta \mathcal{L}}{\delta \dot{q}} \delta q \right)}_{\text{vanishes (B.C.s)}} \tag{3}$$
$$\Rightarrow \boxed{\frac{\delta \mathcal{L}}{\delta q} - \frac{\mathrm{d}}{\mathrm{d}t} \frac{\delta \mathcal{L}}{\delta \dot{q}} = 0}$$

The converse is equally true, hence:

A simple derivation

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\end{aligned} \tag{3}$$

$$\Rightarrow \boxed{\frac{\delta\mathcal{L}}{\delta q} - \frac{\mathrm{d}}{\mathrm{d}t}\frac{\delta\mathcal{L}}{\delta\dot{q}} = 0}$$

The converse is equally true, hence:

$$\boxed{\delta\mathcal{S} = 0 \text{ \& B.C.s} \iff \frac{\delta\mathcal{L}}{\delta q} - \frac{\mathrm{d}}{\mathrm{d}t}\frac{\delta\mathcal{L}}{\delta\dot{q}} = 0} \tag{4}$$

Questions (2 minutes)

Thank You!

J. Hubbard et Brian Hilton Flowers.
Electron correlations in narrow energy bands.
Proceedings of the Royal Society of London. Series A. Mathematical and Physical Sciences **276**(1365), 238–257 (1963).
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doi:10.1098/rspa.1964.0190.