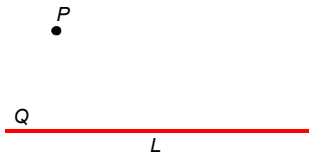
Electric Potential
Continuous Charge Distributions

Two approaches

$V = k\frac{q}{r} \rightarrow V = \int k\frac{dq}{r}$ OR $\Delta V = -\int \vec{E} \cdot d\vec{s}$

Example: What is the electric potential near a line of charge?



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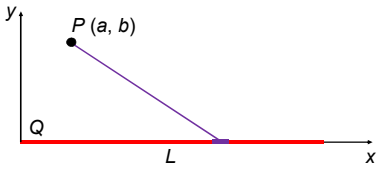

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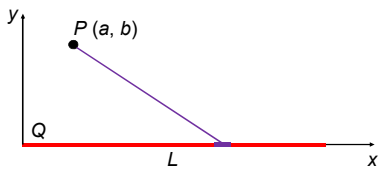
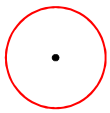


$$V = \int_0^L k \frac{\left(\frac{Q}{L}\right) dx}{\sqrt{(x-a)^2 + b^2}}$$

Example: What is the electric potential at the center of a ring of charge?



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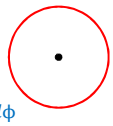

$$V = \int_0^{2\pi} k \frac{\left(\frac{Q}{2\pi R}\right) R d\phi}{R}$$

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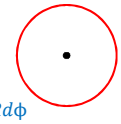
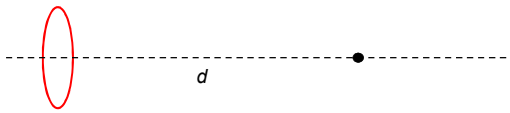


$$V = \int_0^{2\pi} k \frac{\left(\frac{Q}{2\pi R}\right) R d\phi}{R}$$

$$V = k\frac{Q}{R}$$

Example: What is the electric potential on the axis of symmetry of a ring of charge?



Example: What is the electric potential on the axis of symmetry of a disk of charge?