When doing line integrals in cartesian (2D), we use

$$d\vec{r} = \hat{i}\,dx + \hat{j}\,dy$$

What should we use when in plane-polar coordinates?

$A)$ $d\vec{r} = \hat{r}\,dr$

$B)$ $d\vec{r} = \hat{r}\,dr\,d\phi$

$C)$ $d\vec{r} = \hat{r}\,dr + d\phi\,\hat{\phi}$

$D)$ $d\vec{r} = \hat{r}\,dr + r\,d\phi\,\hat{\phi}$

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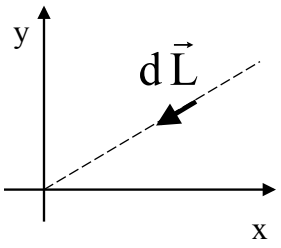
Consider an infinitesimal path element d**L** directed radially inward, toward the origin as shown. In spherical coordinates, the correct expression for d**L** is:



A) $d\vec{L} = +dr\ \hat{r}$

B) $d\vec{L} = -dr\ \hat{r}$

C) Neither of these.

cartesian : $d\vec{L} = dx\ \hat{x} + dy\ \hat{y}$

spherical: $d\vec{L} = dr\ \hat{r} + r\,d\theta\ \hat{\theta} + r\sin\theta\,d\phi\ \hat{\phi}$

Which of the following are conservative forces?

i- friction
ii- Gravity
iii- the normal force

A) i only B) ii only C) iii only
D) i and ii only E) Other/not sure

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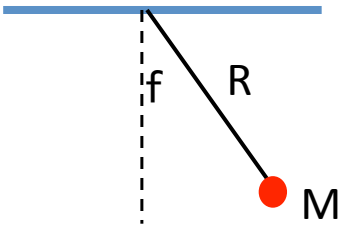
What is the potential energy of M in terms of ϕ? (Take U=0 at ϕ=0)

A)MgRϕ
B)MgRcos(ϕ)
C)MgRsin(ϕ)
D)MgR(1-cos(ϕ))
E) MgR(1-sin(ϕ))



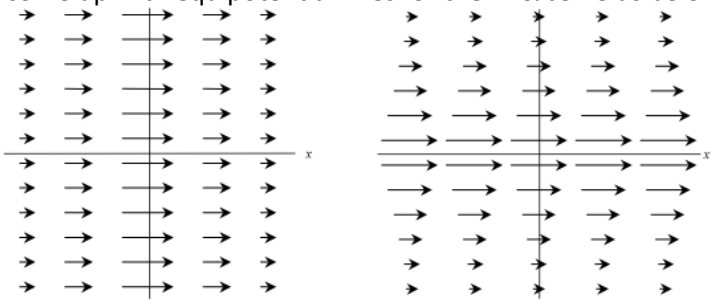
If you finish early .....

Do you agree or disagree with the following statements?

1) "For a conservative force, the magnitude of the force is related to potential energy. The larger the potential energy, the larger the magnitude of the force."

2) "For a conservative force, the magnitude of the force is related to potential energy. For any equipotential contour line, the magnitude of the force must be the same at every point along that contour."

Can you come up with equipotential lines for the 2 force fields below?



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A charge q sits in an electric field $\mathbf{E} = E_0\,\mathbf{i}$, what is the potential energy U(r)?

A) $+qE_0x\,\hat{\mathbf{i}}$

B) $-qE_0x\,\hat{\mathbf{i}}$

C) $+qE_0x$

D) $-qE_0x$

E) Something else!

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Final Verdict:

The Mathematica Help Session will be on ___ from ___ pm.
In the COMPUTER LAB next to the physics library. Feel free to bring your laptop.

Are you planning to attend?

A) Yes
B) No
C) Maybe