The Study
Central + North

Hours: Mon, Tue, Thur: 2-10
Sunday: 4-10
Wednesday: 3-10

For This Class

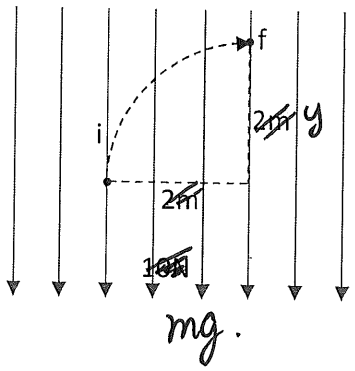
www.uky.edu/the Study

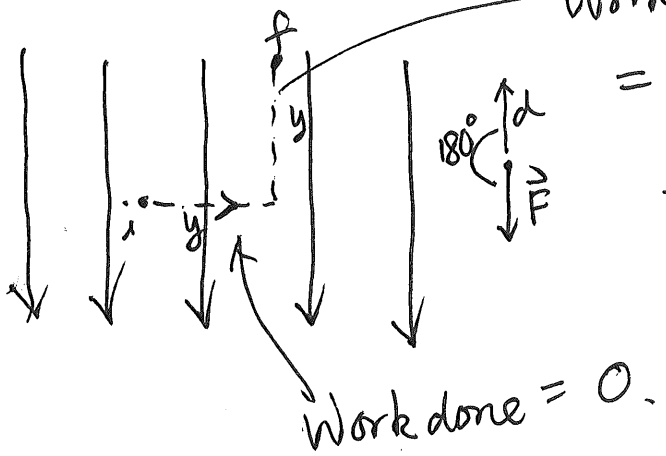
PHY 232 Fall 2017 Supplementary Work (will not be collected)

Class 2. Energy

Near earth surface the weight of an object is a constant, say, 10N downward.

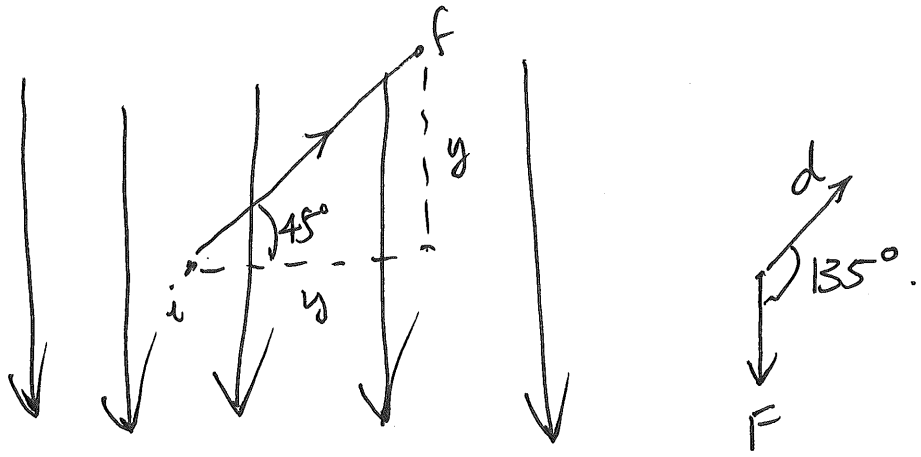
The object is moved directly from i to f along a circular arc as shown in the diagram. What is the work done by the weight?





Total work done $= -mgy$.

$\Delta U = -$ Work done $= mgy$.



$$\text{Work done} = (mg)(\sqrt{2}\,y)\cos 135^\circ.$$

$$= -mg(\sqrt{2}y)\left(\frac{1}{\sqrt{2}}\right).$$

$$= -mgy.$$

$$\therefore \Delta U = mgy.$$

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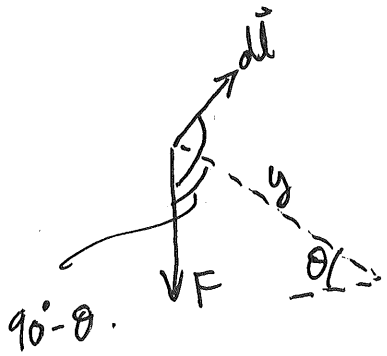
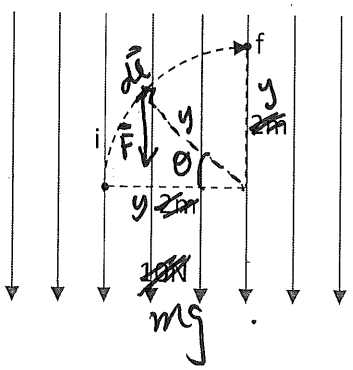




$$W = \int_i^f \vec{F} \cdot d\vec{l}$$

$\vec{A} \cdot \vec{B} = |\vec{A}||\vec{B}|\cos\theta$

$\vec{F} \cdot d\vec{l}$ ↑ Dot product.

$= mg\, dl \cos(90° + (90° - \theta))$

$= mg\, dl \cos(180° - \theta)$

$= -mg\, dl \cos\theta$.

$$\int_i^f \vec{F} \cdot d\vec{l} = -mg \int_i^f dl \cos\theta$$

$dl = R\, d\theta$

$= y\, d\theta$.

$$= -mg \int_0^{90°} y \cos\theta \, d\theta$$

$$= -mg\, y \left[\sin\theta\right]_0^{90°}$$

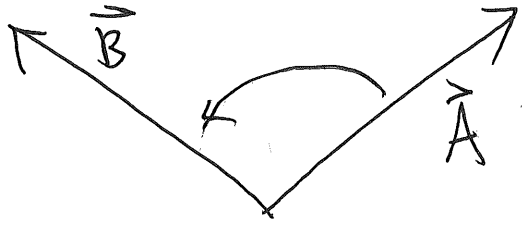
$$= -mgy(1 - 0) = \underline{-mgy}$$

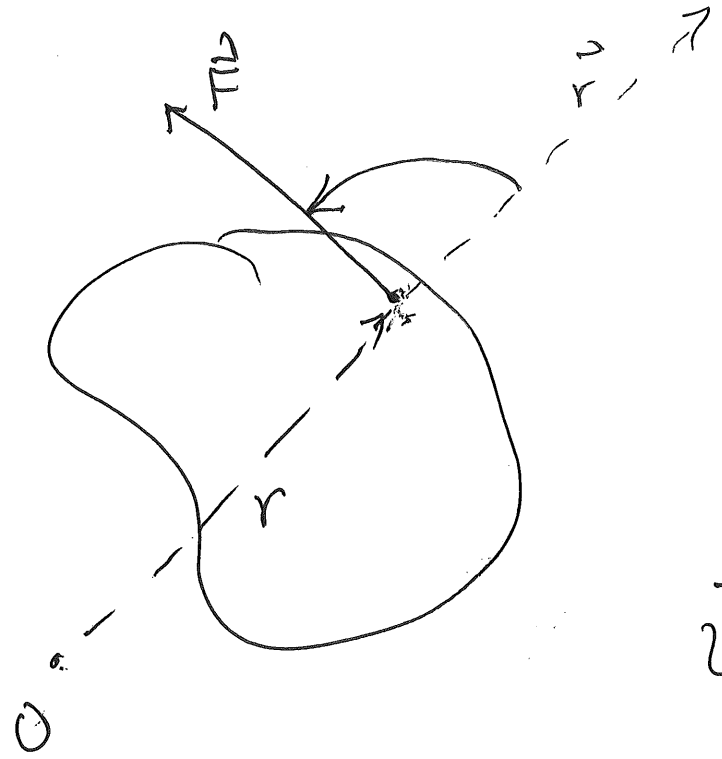
$$\vec{A} = \hat{i} + 2\hat{j} + 3\hat{k} \qquad |\vec{A}| = \sqrt{1^2+2^2+3^2} = \sqrt{14}$$

$$\vec{B} = 2\hat{i} + 3\hat{j} + 4\hat{k} \qquad |\vec{B}| = \sqrt{2^2+3^2+4^2} = \sqrt{29}$$

(c) $\angle$ between $\vec{A}$ and $\vec{B}$

$$|\vec{A}\times\vec{B}| \longrightarrow \sin\theta = \frac{|\vec{A}\times\vec{B}|}{|\vec{A}||\vec{B}|}$$





$$\vec{v} = \frac{d\vec{r}}{dt}.$$

$$\vec{\tau} = \vec{r} \times \vec{F}$$

Direction: ⊙