

## Problem 7.43

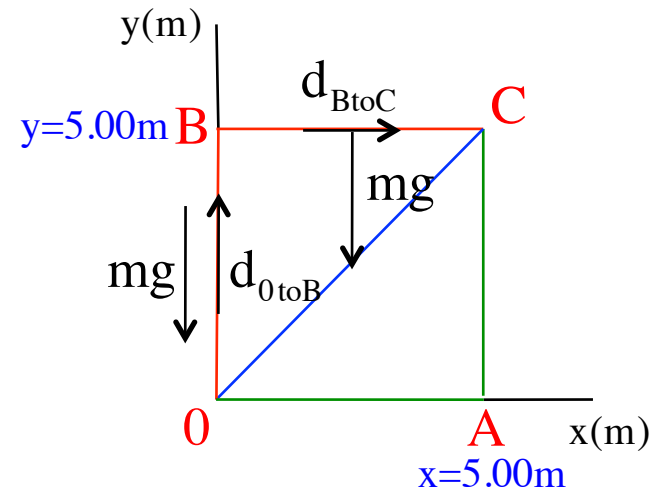
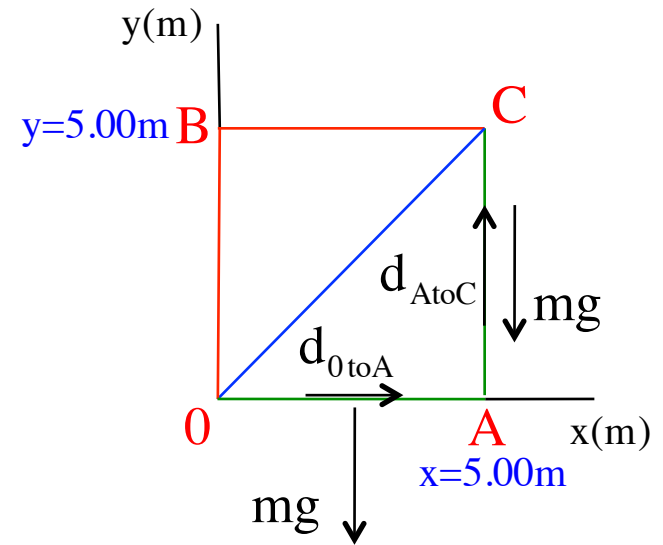
Determine the work gravity, directed downward, does on a body that move over path:

a.) 0-A-C (the green line):

$$\begin{aligned}
 W_g &= \vec{F}_g \bullet \vec{d}_{0\text{toA}} + \vec{F}_g \bullet \vec{d}_{\text{AtoC}} \\
 &= (mg)d \cos 90^\circ + (mg)d \cos 180^\circ \\
 &= (4.00 \text{ kg})(9.80 \text{ kg})(5.00 \text{ m})(-1) \\
 &= -196 \text{ J}
 \end{aligned}$$

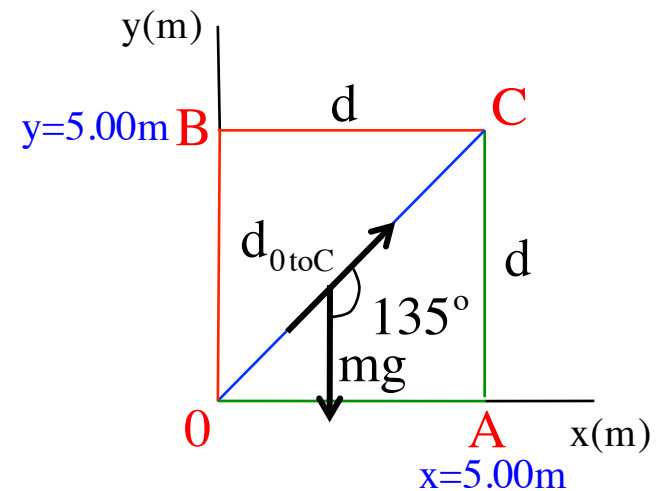
b.) 0-B-C (the red line):

$$\begin{aligned}
 W_g &= \vec{F}_g \bullet \vec{d}_{0\text{toB}} + \vec{F}_g \bullet \vec{d}_{\text{BtoC}} \\
 &= (mg)d \cos 180^\circ + (mg)d \cos 90^\circ \\
 &= (4.00 \text{ kg})(9.80 \text{ kg})(5.00 \text{ m})(-1) \\
 &= -196 \text{ J}
 \end{aligned}$$



c.) 0-C (the blue line):

$$\begin{aligned}W_g &= \vec{F}_g \bullet \vec{d}_{0\text{to}C} \\&= (mg) \left[ \left( d^2 + d^2 \right)^{1/2} \right] \cos 135^\circ \\&= (4.00 \text{ kg})(9.80 \text{ m/s}^2)(5.00\sqrt{2} \text{ m})(-0.707) \\&= -196 \text{ J}\end{aligned}$$



d.) Why are they the same?

Gravity is a conservative force, which is to say that the amount of work it does on a body moving through it is dependent upon the end-points ONLY(that is, the work it does is *path-independent*, as is the case with all conservative forces).