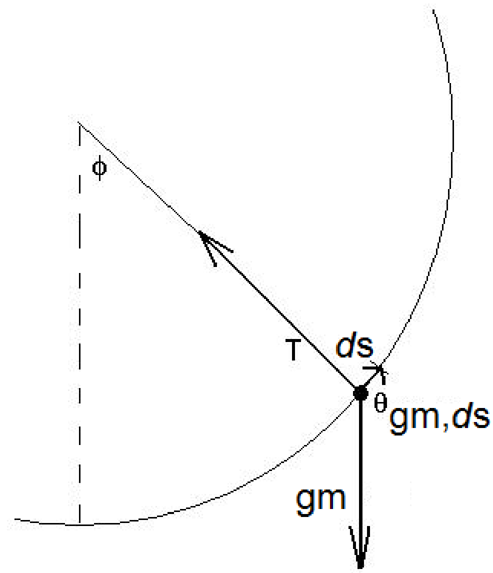
6-1)
m = 0.8 kg
R = 1.6m

a)
Start at the bottom of the circle.



$$W_T = \oint \boldsymbol{T} \cdot d\boldsymbol{s} = 0\,,$$

since the tension is perpendicular to the path of the object at all points. The quantity *d***s** is a small displacement of the object along the circular path.

b)

$$W_g = \oint \boldsymbol{gm} \cdot d\boldsymbol{s} = \oint gm\,ds\,\cos\theta\,.$$

Let's make two changes of variable. Let $ds = R\,d\phi$ (arclength formula) and, since $\theta_{g,ds} = 90+\phi$, let $\cos\theta_{g,dl} = -\sin\phi$. Substituting,

$$W_g = \oint gm(-\sin\phi)R\,d\phi = -gmR\int_0^{2\pi} \sin\phi\,d\phi = +gmR\,\cos\phi|_0^{2\pi} = 0.$$

The shorter way of finding W_g is to realize that it is $-\Delta U_g$. Since the change in potential energy depends only on the starting and ending positions, which are the same, $\Delta U_g = 0$ and then so does W_G.

c)
Same answer and reasoning as in (a), 0 J.

d)
Same integral as in (b), but limits are from 0 to π:

$$W_g = +gmR\,\cos\phi|_0^{\pi} = +gmR\,[\cos\pi - \cos 0] == +gmR\,[-1-1] = -2gmR.$$

This should not be unexpected, since $\Delta U_g = gm\Delta y = +gm(2R)$.

So, Wg = -2gmR = -2*10*0.8*1.6 = 25.6 J