~~20-WE~~

20-P-WE-AF-005

Work of Force : Advanced

Q: A force described as $F = s/2 + A$, and $\theta = s$ rad. What is the work done between s_1 to s_2?

A:

$$\int_{s_1}^{s_2} \left[\frac{s}{2} + A\right] \cos(s)\, ds$$

$$= \frac{1}{2}\int (s + 2A)\cos(s) \qquad \int fg' = fg - \int f'g$$

$f = s + 2A \qquad g' = \cos(s)$

$f' = 1 \qquad g = \sin(s)$

$$= (s + 2A)\sin(s) - \int \sin(s)\, ds \Big|_{s_1}^{s_2}$$

$$= \left[(s + 2A)\sin(s) + \cos(s)\right]^{1/2} \Big|_{s_1}$$

$$\Rightarrow \frac{(s_2 + 2A)\sin(s_2)}{2} + \frac{\cos(s_2)}{2} - \frac{(s_1 + 2A)\sin(s_1)}{2} - \frac{\cos(s_1)}{2}$$