Name: Richard

QUIZ 7

MATH 201
February 6, 2025

1. A variable force moves an object from 0 to 5 on the number line (units in meters). At any point x between 0 and 5, the force is $\frac{2x}{x^2+1}$ Newtons. Find the work done in moving the object from 0 to 5.

$$W = \int_0^5 \frac{2x}{x^2+1}\,dx$$

$$\begin{cases} u = x^2+1 \\ du = 2x\,dx \end{cases}$$

$$= \int_{0^2+1}^{5^2+1} \frac{1}{u}\,du$$

$$= \Big[\ln|u|\Big]_1^{26}$$

$$= \ln|26| - \ln|1|$$

$$= \boxed{\ln(26)\ \text{J}}$$

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QUIZ 7

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1. A variable force moves an object from $\ln(\pi/4)$ to $\ln(\pi/2)$ on the number line (units in meters). At any point x between $\ln(\pi/4)$ and $\ln(\pi/2)$, the force is $e^x \cos(e^x)$ Newtons. Find the work done in moving the object from $\ln(\pi/4)$ to $\ln(\pi/2)$.

$$W = \int_{\ln\frac{\pi}{4}}^{\ln\frac{\pi}{2}} e^x \cos(e^x)\,dx$$

$$\begin{cases} u = e^x \\ du = e^x dx \end{cases}$$

$$= \int_{e^{\ln\frac{\pi}{4}}}^{e^{\ln\frac{\pi}{2}}} \cos(u)\,du$$

$$= \int_{\pi/4}^{\pi/2} \cos(u)\,du = \Big[\sin(u)\Big]_{\pi/4}^{\pi/2}$$

$$= \sin\frac{\pi}{2} - \sin\frac{\pi}{4}$$

$$= \boxed{1 - \frac{\sqrt{2}}{2} \text{ J}}$$