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Tugas 1 Fisdas

1) Sebuah kawat panjangnya L dan luas penampangnya A. Jika kawat ditarik akan bertambah panjang sejauh x, maka kerja yang dilakukan untuk menarik kawat adalah $z\frac{Ax^2}{2L}$. Carilah dimensi z dan satuannya.

$\Rightarrow$ Kerja $= z\frac{Ax^2}{2L}$, dimensi $z = \ldots$?

$$z\frac{Ax^2}{2L} = [M][L]^2[T]^{-2}$$

$$z\,Ax^2 = [M][L]^{-2}[T]^{-2}$$

$$z = [M][L]^{-1}[T]^{-2} \quad ; \text{ Satuan } = \text{Pa}$$

2) carilah turunan dari fungsi :

a) $y = \ln\left\{ \alpha \cdot \dfrac{x}{(e^{3x}+5)^2} \right\}$

$\Rightarrow f'(x) = \dfrac{1\,(e^{3x}+5)^{52} - x\{2(e^x+5)(3e^{3x}+0)\}}{(e^{3x}+5)^4}$

$= \dfrac{(e^{3x}+5)^2\{(e^{3x}+5)^2 - 6x\cdot e^{3x}\}}{(e^{3x}+5)^{4\cdot 3}}$

$= \dfrac{(e^{3x}+5) - 6x\,e^{3x}}{(e^{3x}+5)^3}$

$y' = \ln(f(x))$

$> \dfrac{f'(x)}{f(x)}$

$= \dfrac{\dfrac{(e^{3x}+5)^2 - 6x\cdot e^{3x}}{(e^{3x}+5)^3}}{\dfrac{x}{(e^{3x}+5)^2}}$

$= \dfrac{e^{3x}+5 - 6xe^{5x}}{x(e^{3x}+5)}$ //

b) $y = \tan^2(e^{-2x})$

$\Rightarrow y' = 2\tan(e^{-2x}) \cdot \sec^2(e^{-2x}) \cdot (-2e^{-2x})$

$= -4\tan(e^{-2x}) \cdot \sec^2(e^{-2x}) \cdot (e^{-2x})$ //

3) a) $\displaystyle\int \frac{dx}{a+bx^2} = \int \frac{1}{a*+bx^2} \, dx$

mis. $a*bx^2 = y$

$\Rightarrow y \to \dfrac{dy}{dx} = 2b$

$dx = \dfrac{dy}{2b}$

$\displaystyle\int \frac{1}{y} \cdot \frac{dy}{2b} = \frac{1}{2b} \int \frac{1}{y} \, dy$

$= \dfrac{1}{2b} \ln|y| + c$

$= \dfrac{1}{2b} \ln|a+bx^2| + c$

b) $\displaystyle\int x\sqrt{1-2x^2} \, dx$

$\Rightarrow \displaystyle\int x(1-2x^2)^{\frac{1}{2}} \, dx$

mis. $1-2x^2 = u$

$\dfrac{du}{dx} = -4x$

$x\,dx = \dfrac{du}{-4}$

$\displaystyle\int u^{\frac{1}{2}} \left(-\frac{1}{4}\right) du$

$-\dfrac{1}{4} \displaystyle\int \left(\frac{2}{3} u^{\frac{2}{3}}\right) + c$

$-\dfrac{1}{6}\left(1-2x^2\right)^{\frac{3}{2}} + c$

$-\dfrac{1}{6}\sqrt{(1-2x^2)^3} + c$ //

4) Diketahui vektor-vektor posisi s66:

$\vec{r_1} = 2\vec{i} + 4\vec{j}$

$\vec{r_2} = 3\vec{j} + 2\vec{u}$

$\vec{r_3} = \vec{i} - 2\vec{j} + 4$

a) $\vec{r_1} \cdot (\vec{r_2} \times \vec{r_3}) = 2i + 4j \cdot (3j - 2u \times i - 2j + u)$

$\qquad = 2i + 4j \cdot (7i + 2j + 3u)$

$\qquad = 14 + 8 + 0$

$\qquad = 22$

b) $\vec{r_2} \cdot (\vec{r_3} \times \vec{r_1}) = 3j + 2u \cdot (i - 2j + u \times 2i + 4j)$

$\qquad = 3j + 2u \cdot (-4i + 2j + 8u)$

$\qquad = 0 + 6 + 16$

$\qquad = 22$

c) $\vec{r_3} \cdot (\vec{r_1} \times \vec{r_2}) = i - 2j + u \cdot (2i + 4j \times 3j + 2u)$

$\qquad = i - 2j + u \cdot (8i - 4j + 6u)$

$\qquad = 8 + 8 + 6$

$\qquad = 22$

d) Sudut yang diapit oleh vektor-vektor tersebut

$|\vec{r_1}| = \sqrt{2^2 + 4^2} = \sqrt{20}$

$|\vec{r_2}| = \sqrt{3^2 + 2^2} = \sqrt{13}$

$|\vec{r_3}| = \sqrt{1^2 + 2^2 + 1^2} = \sqrt{6}$

$\cos \theta = \dfrac{\vec{a} \times \vec{b}}{|\vec{a}| \times |\vec{b}|}$

$r_1 - r_2 \qquad \vec{a} = r_1 - r_2 = \begin{pmatrix} 2 \\ 4 \\ 6 \end{pmatrix} - \begin{pmatrix} 0 \\ 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 2 \\ 1 \\ -2 \end{pmatrix}$

$|\vec{a}| = \sqrt{2^2 + 1^2 + (-2)^2} = \sqrt{9} = 3$

$\vec{b} = r_3 - r_2 = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix} - \begin{pmatrix} 0 \\ 3 \\ 2 \end{pmatrix} = \begin{pmatrix} 1 \\ -5 \\ -1 \end{pmatrix}$

$|\vec{b}| = \sqrt{1^2 + (-5)^2 + (-1)^2} = \sqrt{27} = 3\sqrt{3}$

$$\cos \theta = \frac{2 - 5 + 2}{3 \cdot 3\sqrt{3}} = \frac{1}{9\sqrt{3}} = -\frac{\sqrt{3}}{27}$$

$$\cos \theta = -\frac{\sqrt{3}}{27}$$

$$\theta = 86,34°$$

5) Sebutkan 10 besaran fisika dan nyatakan dalam dimensi!

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Besaran	Dimensi
Panjang	$[L]$
Massa	$[M]$
Waktu	$[T]$
Suhu	$[\theta]$ $[k]$
Arus listrik	$[I]$
Intensitas cahaya	$[\theta]$
Jumlah zat	$[N]$
Kecepatan	$[L][T]^{-1}$
Gaya	$[L][M][T]^{-2}$
Massa jenis	$[M][L]^{-3}$