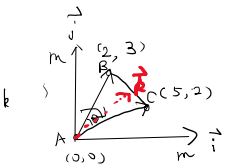
R2_problems

Thursday, January 11, 2024 3:05 PM



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

Solve area of $\triangle ABC$

$\vec{AB}$: m

$\vec{AC}$: m

$\vec{AB} \times \vec{AC} = |\vec{AB}||\vec{AC}| \sin\theta \, \vec{k}$ ①

$S_{\triangle ABC} = \frac{1}{2}|\vec{AB}||\vec{AC}|\sin\theta$ ②

From ①, ②

$S_{\triangle ABC} = \frac{1}{2}|\vec{AB} \times \vec{AC}|$

$\vec{AB} = (2,3)$; $\vec{AC} = (5,2)$

$$\vec{AB} \times \vec{AC} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 2 & 3 & 0 \\ 5 & 2 & 0 \end{vmatrix} = \vec{i}(3\times 0 - 2\times 0) - \vec{j}(2\times 0 - 5\times 0) + \vec{k}(2\times 2 - 5\times 3)$$

$$= 0 - 0 + (-11)\vec{k}$$

$$S_{\triangle ABC} = \frac{1}{2}|\vec{AB} \times \vec{AC}| = \frac{1}{2}|-11\vec{k}| = 5.5 \ m^2$$

Heron's formula

$$S_\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$s = \frac{1}{2}(a+b+c)$$

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ab=sqrt(13)
ac=sqrt(29)
bc=sqrt(10)

s = 0.5 * (ab + ac + bc)

area = sqrt(s * (s-ab) * (s-ac) * (s-bc))
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ab = 3.6056
ac = 5.3852
bc = 3.1623

s = 6.0765

area = 5.5000
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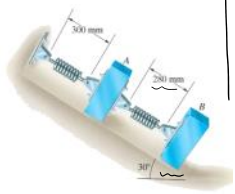
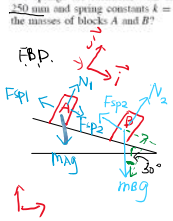
- 2D Force

Problem 1 The inclined surface is smooth (Remember that "smooth" means that friction is negligible). The two springs are identical, with unstretched lengths of 250 mm and spring constants $k = 1200$ N/m. What are the masses of blocks A and B?





$F_{sp2} = \frac{1}{2}m_B g$ ①

$F_{sp2} = k(L - L_1) = 1200 \text{ N/m} \cdot (0.28\text{m} - 0.25\text{m}) = 36\text{N}$

From Eq. ①

$m_B = \frac{2F_{sp2}}{g} = \frac{2\times 36}{9.8}\text{kg} = 7.3469\text{kg}$

$F_{sp1} = \frac{1}{2}m_A g + F_{sp2}$

$m_A = \frac{2(F_{sp1} - F_{sp2})}{g}$ ②

$F_{sp1} = k(0.2 - 0.25) = 60\text{N}$

plug into ②

$m_A = \frac{2(60-36)}{9.8}\text{kg} = 4.89\text{kg}$