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7. Application (physics)

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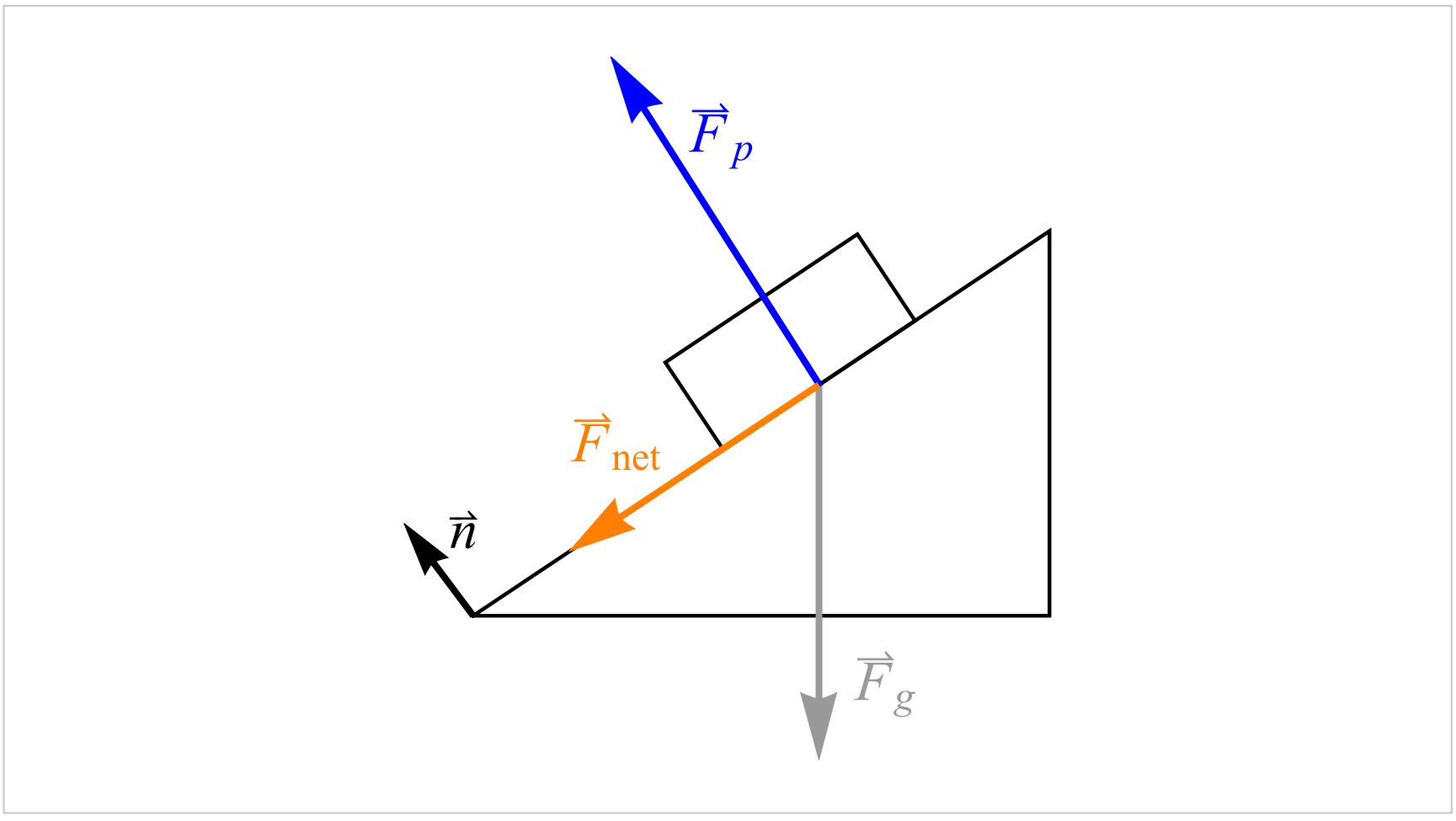
Problem Set A due Aug 18, 2021 20:30 IST Completed

Practice

2A-9

2.0/2 points (graded)

Consider a rectangular mass on a frictionless plane as in the figure shown below. (The figure is not drawn to scale.)



The force of gravity on the mass is $\vec{F}_g = \langle 0, -10 \rangle$. Suppose the unit normal vector to the plane is $\hat{n} = \langle -3/5, 4/5 \rangle$. The inclined plane exerts a force $\vec{F}_p$ on the mass in the direction $\hat{n}$. The net force on the mass is

$$\vec{F}_{\text{net}} = \vec{F}_g + \vec{F}_p \tag{3.127}$$

and this net force is parallel to the inclined plane. Given this information, find $\vec{F}_p$ and $\vec{F}_{\text{net}}$.

$\vec{F}_p =$ [-24/5,32/5] ✔ **Answer:** [-24/5,32/5]

$\vec{F}_{\text{net}} =$ [-24/5,-18/5] ✔ **Answer:** [-24/5,-18/5]

? INPUT HELP

Solution:

First, rewrite equation 3.127 as

$$\vec{F}_g = \vec{F}_{\text{net}} - \vec{F}_p. \tag{3.128}$$

Decompose $\vec{F}_g$ into a vector parallel to the unit vector $\hat{n}$ (which will give us $-\vec{F}_p$) an li
$\hat{n}$ (which will give us $\vec{F}_{\text{net}}$). Doing this gives

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$\vec{n}$ (which will give us $\vec{F}_{\text{net}}$). Doing this gives

$$-\vec{F}_p = \left(\vec{F}_g \cdot \hat{n}\right)\hat{n} = -8\langle -\frac{3}{5}, \frac{4}{5}\rangle = \langle \frac{24}{5}, -\frac{32}{5}\rangle. \tag{3.129}$$

Therefore,

$$\vec{F}_p = \langle -\frac{24}{5}, \frac{32}{5}\rangle. \tag{3.130}$$

Then we can find $\vec{F}_{\text{net}}$ by computing

$$\vec{F}_{\text{net}} = \vec{F}_g + \vec{F}_p = \langle 0, -10\rangle + \langle -\frac{24}{5}, \frac{32}{5}\rangle = \langle -\frac{24}{5}, -\frac{18}{5}\rangle. \tag{3.131}$$

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Answers are displayed within the problem

7. Application (physics)

Topic: Unit 2: Geometry of Derivatives / 7. Application (physics)

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- small typo in solution — 2
  Hello. "vector perpendicular to n^ (which will give us F sub p)" probably needs to be F net. Best wishes.
- [staff] Are solutions exact numbers? — 5
  Given F_g is [0,-10] and normal unit vector [-3/5,4/5], I suppose there are many solutions to this questions. If my argument is incorre...
- Stumped again. — 5
  I am assuming that the net force represents the tangent component? So does that mean I have to find the tangent component of the...
- [Staff] Inconsistent Notation — 2

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