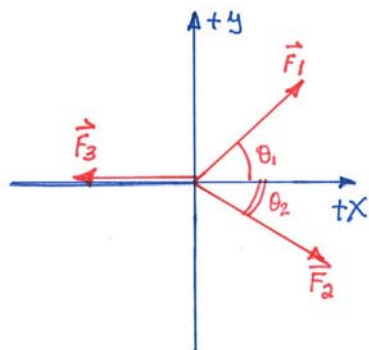


P2211K, Fall 2010.
Quiz # 4 (9/21/2010)

Basic Problem:

A 5.0 kg object is acted on by three forces as sketched below.



- a. Calculate the x- and y- components of the object's resulting acceleration.

x - direction :

$$ma_x = F_{netx} = F_{1x} + F_{2x} + F_{3x}$$

$$a_x = F_{netx} / m$$

y - direction :

$$ma_y = F_{nety} = F_{1y} + F_{2y} + F_{3y}$$

$$a_y = F_{nety} / m$$

- b. If the object starts from rest, how fast is it traveling after 5 seconds?

$$a = \sqrt{a_x^2 + a_y^2}$$

$$v_f = v_0 + at$$

Version 1: \vec{F}_1 is 15 N @ $\theta_1 = 35^\circ$, \vec{F}_2 is 25 N @ $\theta_2 = 25^\circ$, and \vec{F}_3 is 20 N.

- $a_x = [(15 \text{ N}) \cos 35^\circ + (25 \text{ N}) \cos 25^\circ - 20 \text{ N}] / (5 \text{ kg}) = 2.99 \text{ m/s}^2$
- $a_y = [(15 \text{ N}) \sin 35^\circ + (25 \text{ N}) \sin 25^\circ + 0 \text{ N}] / (5 \text{ kg}) = -0.392 \text{ m/s}^2$
- $a = 3.01 \text{ m/s}^2$
- $v_f = 15.1 \text{ m/s}$

Version 2: \vec{F}_1 is 20 N @ $\theta_1 = 25^\circ$, \vec{F}_2 is 15 N @ $\theta_2 = 35^\circ$, and \vec{F}_3 is 25 N.

- $a_x = [(20 \text{ N}) \cos 25^\circ + (15 \text{ N}) \cos 35^\circ - 25 \text{ N}] / (5 \text{ kg}) = 1.08 \text{ m/s}^2$
- $a_y = [(20 \text{ N}) \sin 25^\circ + (15 \text{ N}) \sin 35^\circ + 0 \text{ N}] / (5 \text{ kg}) = -0.03 \text{ m/s}^2$
- $a = 1.08 \text{ m/s}^2$
- $v_f = 5.40 \text{ m/s}$

Version 3: \vec{F}_1 is 25 N @ $\theta_1 = 25^\circ$, \vec{F}_2 is 15 N @ $\theta_2 = 35^\circ$, and \vec{F}_3 is 10 N.

- $a_x = [(25 \text{ N}) \cos 25^\circ + (15 \text{ N}) \cos 35^\circ - 10 \text{ N}] / (5 \text{ kg}) = 4.99 \text{ m/s}^2$
- $a_y = [(25 \text{ N}) \sin 25^\circ + (15 \text{ N}) \sin 35^\circ + 0 \text{ N}] / (5 \text{ kg}) = 0.392 \text{ m/s}^2$
- $a = 5.00 \text{ m/s}^2$
- $v_f = 25.0 \text{ m/s}$