NO Reading assigament

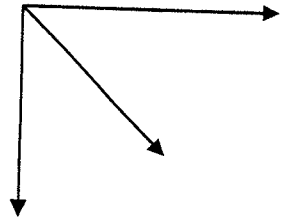
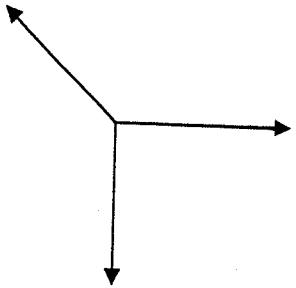
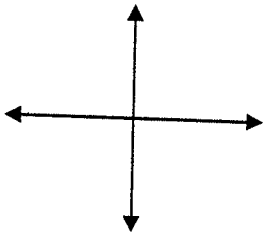
H.w Due Friday

office hours 10:30-11:30 today

Action Center Thursday 5-7 wagner 145

Group problem tomorrow

A firecracker at rest explodes into many pieces of approximately equal mass. Which of the following diagrams show the possible velocities the pieces have?

- A) 
B) 
C) 

A) A
B) B
C) C
D) More than one of the above
E) All of the above

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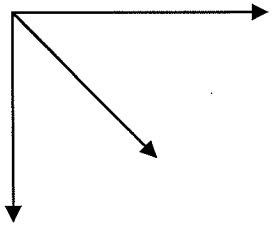
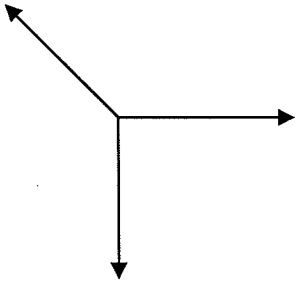
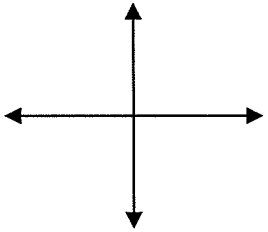
- A) 
B) 
C) 

A) A
B) B
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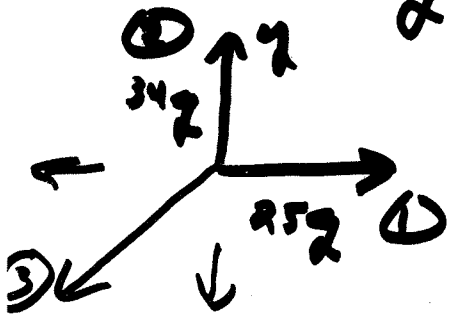
ex) A firecracker of mass 100g at rest explodes into 3 parts. One part with mass = 25g moves along x-axis at 75 m/s. Another part of mass 34g moves along y-axis at 52 m/s. What is velocity of 3rd part?



$\vec{v}=0 \quad \vec{p}=0$

$p_{y_1}=0$

$p_{x_1}=0$

$m_3 = 100g - 25g - 34g$

$m_3 = 41g$

$x: \; m_1 v_1 + m_3 v_{3x} = 0$

$y: \; m_2 v_2 + m_3 v_{3y} = 0$

$$v_{3x} = \frac{-m_1 v_1}{m_3}$$

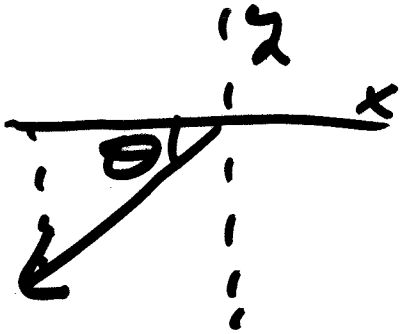
$$v_{3y} = \frac{-m_2 v_2}{m_3}$$

$v_{3x} = -46 \text{ m/s}$

$v_{3y} = -43 \text{ m/s}$

$$v_3 = \sqrt{(-46 \text{ m/s})^2 + (-43 \text{ m/s})^2}$$

$v_3 = 63 \text{ m/s}$

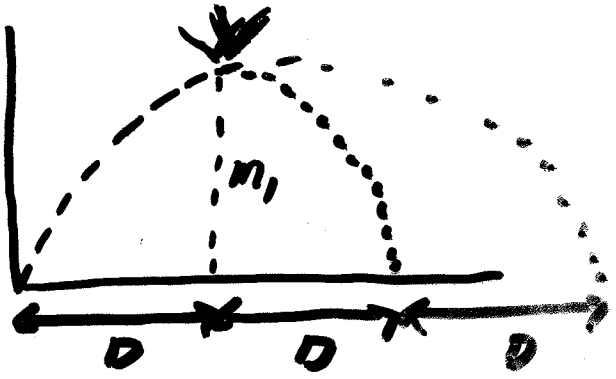


$\tan\theta = \frac{v_{3y}}{v_{3x}}$

$\theta = 43^\circ$ below negative x-axis

ex) A rocket is launched and at its peak it explodes into 2 pieces. One piece falls straight down. Where does other piece land?

a) $m_1 = m_2$
b) $m_2 = 3m_1$



a) 2D from m_1

x = distance trying to find

b) $2D = \frac{Dm_1 + xm_2}{m_1 + m_2}$

$2D = \frac{Dm_1 + x3m_1}{m_1 + 3m_1}$

$2D = \frac{D + 3x}{4}$

$2D = \frac{D}{4} + \frac{3x}{4} \Rightarrow \frac{3x}{4} = \frac{7D}{4}$

$$\boxed{x = \frac{7}{3}D}$$

A person is saved by an airbag. without an airbag, their head would have hit the windshield. Compared to the windshield the airbag

A) Does more work

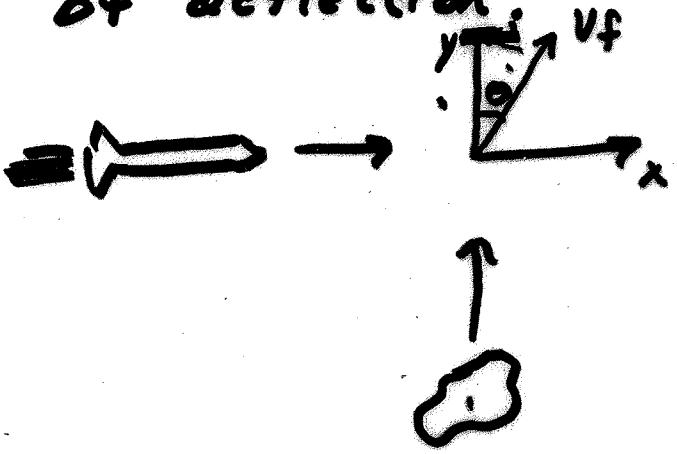
B) Exerts a much smaller force

C) Exerts a much smaller impulse

D) Exerts a much smaller change in momentum

E) Causes a much smaller change in Kinetic Energy

A rocket of mass 2×10^6 kg traveling in the +x direction with a speed of 1000 m/s strikes and sticks in an asteroid of mass 1×10^{18} kg traveling in the +y direction with a speed of 3×10^4 m/s. Find the angle of deflection.



Conserve momentum

$x: m_r v_r = (m_a + m_r) v_{fx}$

$y: m_a v_a = (m_a + m_r) v_{fy}$

$$v_{fx} = \frac{m_r v_r}{m_a + m_r} \qquad v_{fy} = \frac{m_a v_a}{m_a + m_r}$$

$v_{fx} = 2\times10^{-9}$ m/s

$v_{fy} = 3\times10^4$ m/s

$$\tan\theta = \frac{v_{fx}}{v_{fy}}$$

$\theta = 4\times10^{-13}$ degrees