

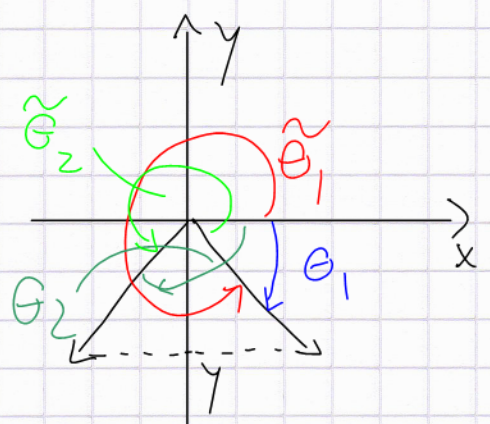
Tutorial, Sept 18

1.52

Given: vector $\vec{r} = (x, y)$ with

$r = |\vec{r}| = 4.5 \text{ m}$ and $y = -2.7 \text{ m}$

Find angle \vec{r} makes with x-axis



$$r^2 = x^2 + y^2$$

$$\Rightarrow x = \pm \sqrt{r^2 - y^2}$$

$$= \pm 3.6 \text{ m}$$

$$\theta_1 = \tan^{-1}\left(\frac{-2.7}{+3.6}\right) = -37^\circ$$

$$\theta_2 = \tan^{-1}\left(\frac{-2.7}{-3.6}\right) = -143^\circ$$

} equivalent

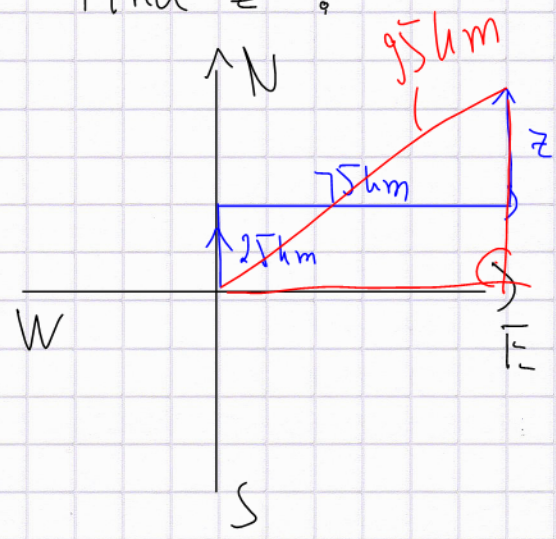
$$\theta_2 = \tan^{-1}\left(\frac{-2.7}{-3.6}\right) = -(180-37)$$

$$\theta_2 = +217^\circ$$

1.54

Person drives 25 km north, then 75 km east, then distance z north. Total displacement: 95 km

Find z



Pythagoras for \triangle :

$$95^2 = 75^2 + (25+z)^2$$

$$\Rightarrow 95^2 - 75^2 = (25+z)^2$$

$$\sqrt{3400} = 25+z$$

$$z = 33 \text{ km}$$

1.60

Mountaineer and his GPS

base camp B: $(0, 0, z_B = 4300)$ m

top of mountain T: $(x_T = 1600, y_T = 4200, z_T = 6200)$ m

Find displacement d

$$d = \sqrt{(x_T - x_B)^2 + (y_T - y_B)^2 + (z_T - z_B)^2}$$

$$= \sqrt{1600^2 + 4200^2 + 1900^2}$$

$$= 4900 \text{ m}$$

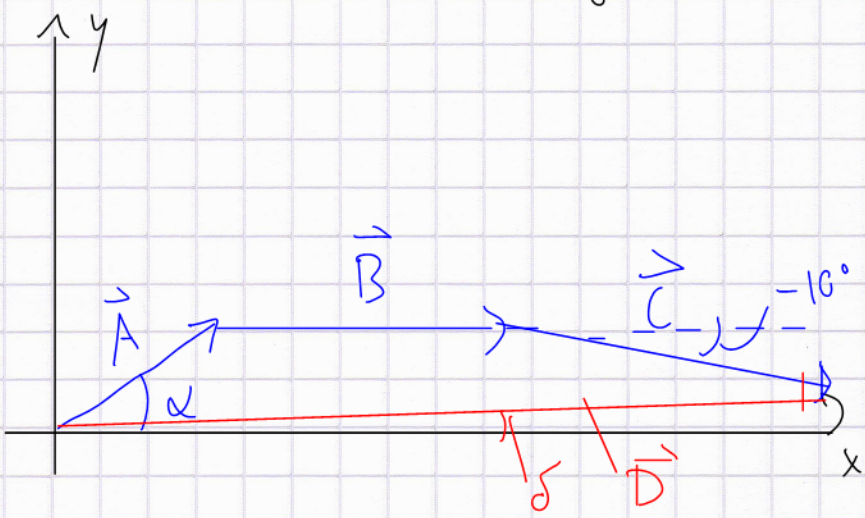
1.64

$|\vec{A}| = 5 \text{ cm}, \alpha = 30^\circ$

$|\vec{B}| = 7.5 \text{ cm}, \beta = 0^\circ$

$|\vec{C}| = 10.0 \text{ cm}, \gamma = 350^\circ$

consider $\vec{D} = \vec{A} + \vec{B} + \vec{C}$



calculate *)

$|\vec{D}| = 22 \text{ cm}$

$\delta = 2^\circ$

*) use

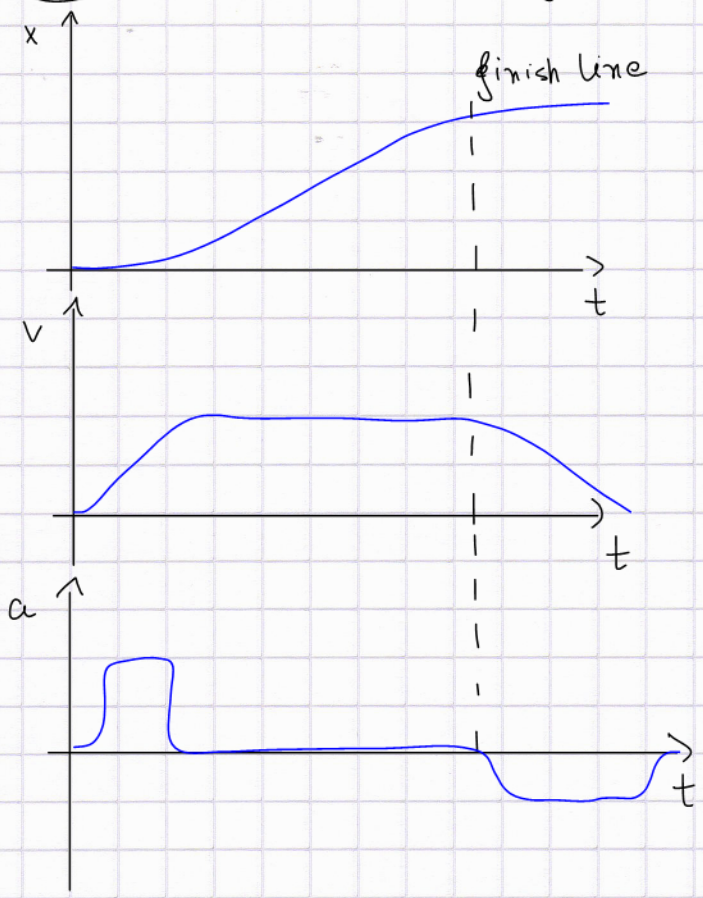
$D_x = A_x + B_x + C_x = A \cos \alpha + B \cos \beta + C \cos \gamma = 21.7 \text{ m}$

$D_y = A_y + B_y + C_y = A \sin \alpha + B \sin \beta + C \sin \gamma = 0.8 \text{ m}$

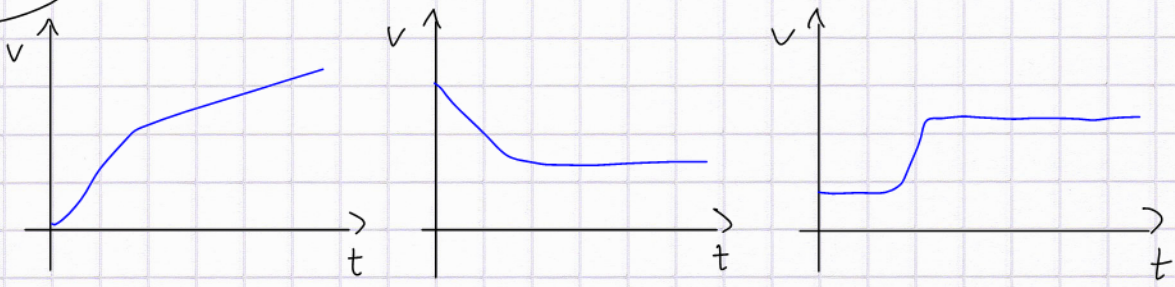
$D = \sqrt{D_x^2 + D_y^2}; \delta = \tan^{-1} \left(\frac{D_y}{D_x} \right)$

2.6

1D motion of a sprinter



2.20



Note that the given $a(t)$ graphs don't tell us the velocity at $t=0$. The three $v-t$ graphs can be shifted up or down and will still be correct.