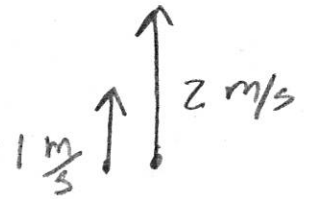
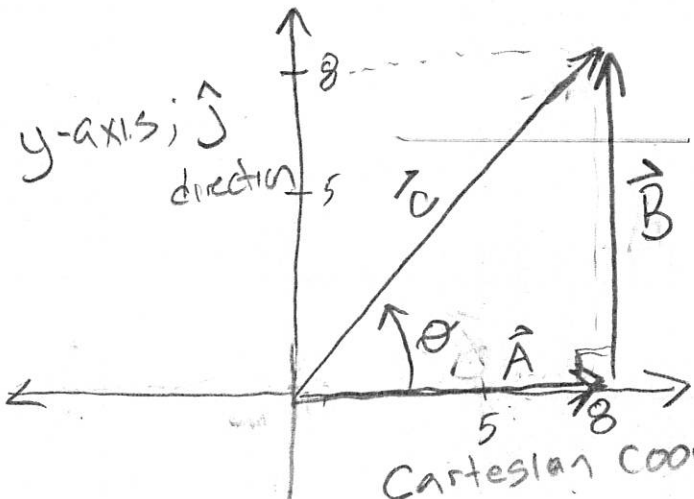
Vectors have direction & magnitude.

In the text a vector is in "Bold". By hand, a vector has a hat.

$\hat{C} = \vec{C} = \vec{C}$




$\phi$ = phi; for elevation

$\vec{C} = 8\hat{i} + 8\hat{j}$

$\vec{C} = 8\hat{i} + 8\hat{j}$

$\vec{C} = \vec{A} + \vec{B}$ magnitude

$\vec{A} = 8\hat{i}$; A = 8 units

$\vec{B} = 8\hat{j}$; B = 8 units

mag $C = (A^2 + B^2)^{\frac{1}{2}}$

$C = \sqrt{(A)^2 + (B)^2}$

$C = (8^2 + 8^2)^{\frac{1}{2}}$

$C = (64 + 64)^{\frac{1}{2}}$

$= (128)^{\frac{1}{2}}$

$C = 11.3$

The magnitude of $\vec{C}$ is 11.3 units.

corelei = +

$$\tan\theta = \frac{opp}{adj} = \frac{8}{8} = 1$$

$$\sin\theta = \frac{opp}{hyp} =$$

$$\cos\theta = \frac{adj}{hyp}$$

$$\tan\theta = \frac{opp}{adj} = \frac{8}{8}$$

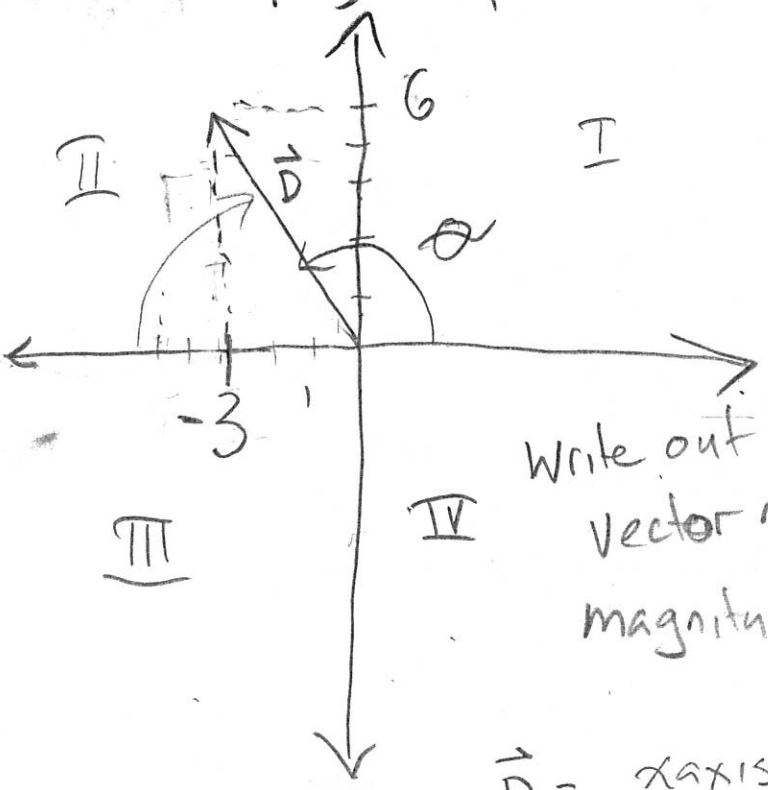
$$\theta = \text{atan}\left(\frac{8}{8}\right)$$

$$\theta = \arctan\left(\frac{8}{8}\right)$$

$$\theta = \tan^{-1}\left(\frac{8}{8}\right) = 45^\circ$$

$$= 0.785398 \text{ radians}$$

$$=$$




Write out $\vec{D}$ in vector notation, magnitude & angle

$\vec{D}$ = xaxis, yaxis

$= -3\hat{i} + 6\hat{j}$

$\text{mag}\,\vec{D} = (-3^2 + 6^2)^{\frac{1}{2}}$

$= (9 + 36)^{\frac{1}{2}}$

$= (45)^{\frac{1}{2}}$

$= 3\sqrt{5}$

$\doteq 6.7$

$$\tan\theta = \frac{\text{OPP}}{\text{adj}}$$

$$\tan\theta = \frac{6}{-3}$$

$$\tan\theta = -2$$

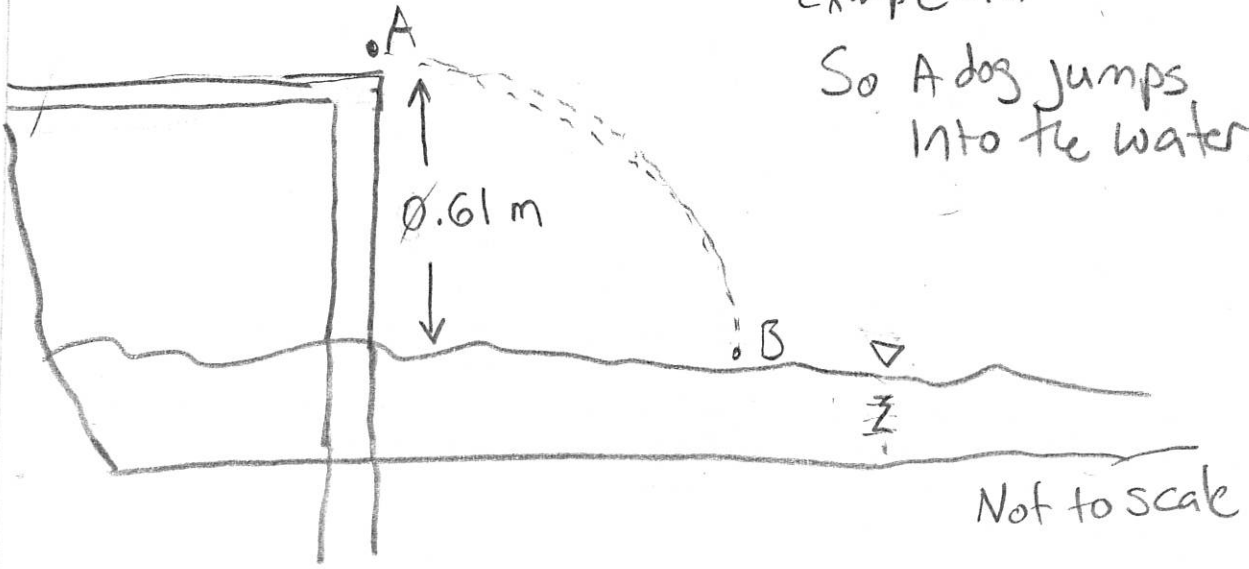
$$\theta = \tan^{-1}(-2)$$

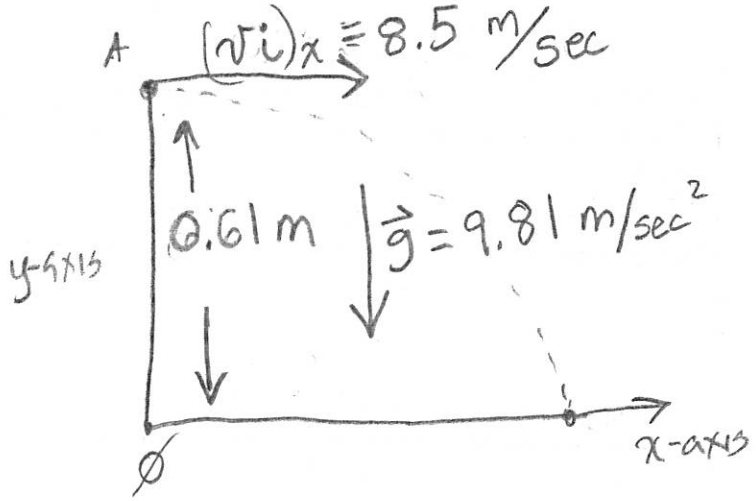
$\doteq -63.4^\circ + 180$

$\doteq 116.6^\circ$ or $-1.107$ rad

Example 3.11

So A dog jumps into the water...




Given

$x_i = 0$

$y_i = 0.61$ m

$(v_i)_x = 8.5$ m/sec

$(v_i)_y = 0$ m/sec

$\vec{a}_x = 0$ m/sec$^2$

$\vec{a}_y = \vec{g} = 9.81$ m/sec$^2$

Find:

Displacement

How far did the dog jump?

$$x_f = x_i + v_x \Delta t$$

$$[m] + \left[\frac{m}{sec}\right] \cdot sec$$

$$x_f = 0 + v_x \Delta t$$

$$x_f = 8.5 \cdot \Delta t$$

$$\vec{v}_y \left[\frac{m}{sec}\right] = \vec{a}_y \left[\frac{m}{sec^2}\right] \Delta t$$

$$y_f = y_i + (v_i)_y \Delta t - \frac{1}{2}\vec{g}(\Delta t)^2$$

$$[m] = [m] + \left[\frac{m}{sec} \cdot sec\right] + \left[\frac{m}{sec^2} \cdot sec^2\right]$$

$$0 = 0.61 + 0 \cdot \Delta t - \frac{1}{2}(9.81)\Delta t^2$$

$$-0.61 = -\frac{1}{2}(9.81)\Delta t^2$$

$$0.61 = \frac{1}{2}(9.81)\Delta t^2$$

$$0.61 = \left(\frac{9.81}{2}\right)\Delta t^2$$

$$\left(\frac{2 \cdot 0.61}{9.81}\right) = \Delta t^2$$

$$\left(\frac{2 \cdot 0.61}{9.81}\right)^{\frac{1}{2}} = \Delta t$$

$$\left(\frac{1.22}{9.81}\right)^{\frac{1}{2}} = \Delta t$$

$$0.353 = \Delta t$$

$$x_f = 8.5\,\Delta t$$

$$x_f = 8.5\,(0.353)$$

$$x_f = 3.0\ m$$

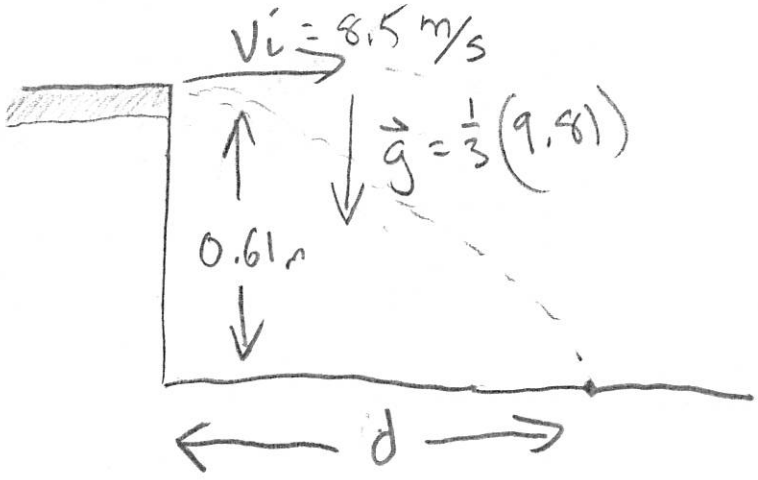
Imagine dog jumping on mars

Assume $\vec{g}_{mars} = \frac{1}{3}\vec{g}_{earth}$

If everything else is the same

how long is the dog Airborne

and what is $d_d$ = displacement of the dog




[Given is as above]

$$y_f = y_i + (v_f)_y \Delta t - \frac{1}{2}\vec{g}_{mars}\Delta t^2$$

$$\emptyset = 0.61m + \emptyset - \frac{1}{2}\left[\frac{1}{3}\cdot 9.81\ m/s^2\right]\Delta t^2$$

$$0.61 = \frac{9.81}{6}\Delta t^2$$

$$\left(\frac{6\cdot 0.61}{9.81}\right)^{\frac{1}{2}} = \Delta t$$

$$0.612 = \Delta t$$

$$x_f = x_i + v\,\Delta t$$

$$x_f = 0 + 8.5 \cdot 0.612$$

$$x_f = 5.2\ m$$

A typical regulation dock jumping dog on Mars will be airborn for 0.61 sec and have a displacement of 5.2 m

On Earth the dog will be airborn for 0.35 sec and will have a displacement of 3 m

W.F.] Good class, following last semester
Right speed

D.T] Good review of magnitude & vectors
Kinematics. Right speed.

T.D.] Good, Improve graphs to
show vector lengths

L.L] Fine. Still fresh. Should be interesting.
Took in feedback.

B.B] Good. Felt comfortable. Visual learner.

Homework: send me a text msg
605-209-9974
with your Name