



Ex) A fish swims in a horizontal plane with $\vec{v}_i = 4\hat{i} + 1\hat{j} \text{ m/s}$ at a position vector of $\vec{r}_i = 10\hat{i} - 4\hat{j} \text{ m}$. The fish swims with uniform acceleration $\vec{a} = \underline{\hspace{2cm}}$ for $t = 20$ seconds until $\vec{v}_f = 20\hat{i} - 5\hat{j} \text{ m/s}$.

a) What is \vec{a} ?

Sol'n: since \vec{a} is uniform, $\vec{a} = \vec{a}_{\text{avg}} = \frac{\Delta \vec{v}}{\Delta t} = \frac{\vec{v}_f - \vec{v}_i}{20}$

$$= \frac{(20\hat{i} - 5\hat{j}) - (4\hat{i} + 1\hat{j})}{20}$$

$$= (16\hat{i} - 6\hat{j}) / 20$$

$$= \boxed{0.8\hat{i} - 0.3\hat{j} \text{ m/s}^2}$$

b) Find direction of \vec{a} .

$$\theta = \tan^{-1}\left(\frac{a_y}{a_x}\right) = \tan^{-1}\left(\frac{-0.3}{0.8}\right) = \boxed{-20.6^\circ}$$

(or $\theta = 339.4^\circ$)

