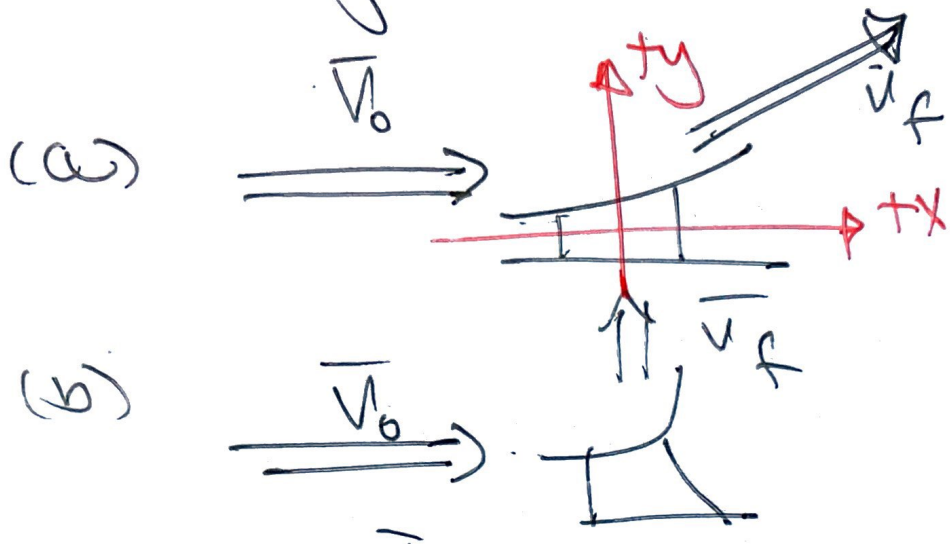
Given



$v_0 = v_f = 40\ m/s$

$\frac{dm}{dt} = 30\ kg/s$

Read: $\vec{F}_{blade}$

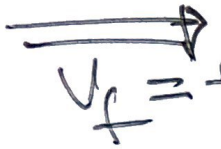
Assump speed/flow are both constant

Strategy $\vec{F} = -\frac{dm}{dt}\vec{v}_{flow}$

Estmate: (c) should give most "forward" force

all will be in range of $30\frac{kg}{s}\,40\ m/s = 1200\ N$

Soln (a) tracking the signs is the challenge here!



$\vec{V}_f = +40\ m/s\ \hat{i}$

$\frac{dm}{dt} = -30\ kg/s$

$\vec{V}_{Hoo} = 40\cos 45^\circ \hat{i} + 40\sin 45^\circ \hat{j}$

28.28

$\frac{dm}{dt} = 30\ kg/s$

Centering!!

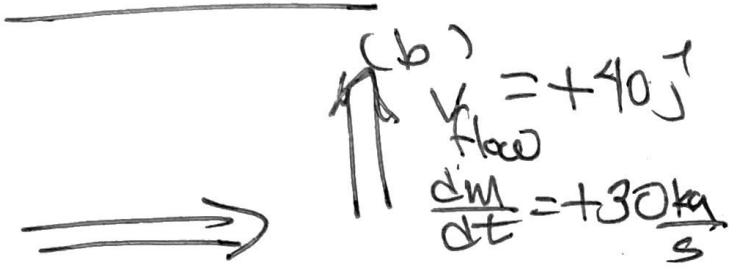
$\vec{F}_{in} = -\left(-\frac{30\ kg}{s}\right)\left(40\ m/s\ \hat{i}\right) = 1200\ N\ \hat{i}$

$\vec{F}_{out} = -\left(\frac{30\ kg}{s}\right)\left(28.3\ m/s\ \hat{i} + 28.3\ m/s\ \hat{j}\right) = -849\ \hat{i} - 849\ \hat{j}\ N$

$\vec{F}_{net} = \vec{F}_{in} + \vec{F}_{out} = 1200\ N\ \hat{i} + \left(-849\ \hat{i} - 849\ \hat{j}\right) N$

$$\boxed{\vec{F}_{net} = 351\ \hat{i} - 849\ \hat{j}}$$

Soln: cont (b)(c)

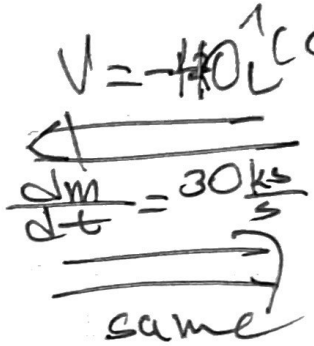


(same)

$\vec{F}_{in} = 1200N\hat{i}$ (from before)

$\vec{F}_{out} = -\left(30\frac{kg}{s}\right)(40\hat{j}) = -1200N\hat{j}$

$\Rightarrow \vec{F}_{net} = 1200N\hat{i} - 1200N\hat{j}$



$\vec{F}_{in} = 1200N\hat{i}$

$\vec{F}_{out} = -\left(30\frac{kg}{s}\right)\left(-40\frac{m}{s}\right)\hat{i}$

$= 1200N\hat{i}$

$\vec{F}_{net} = \vec{F}_{in} + \vec{F}_{out}$

$= 2400N\hat{i}$

Discussion: Matches conceptual thinking (and back of book) and now I feel more comfortable w/ the sign conventions!