

a)

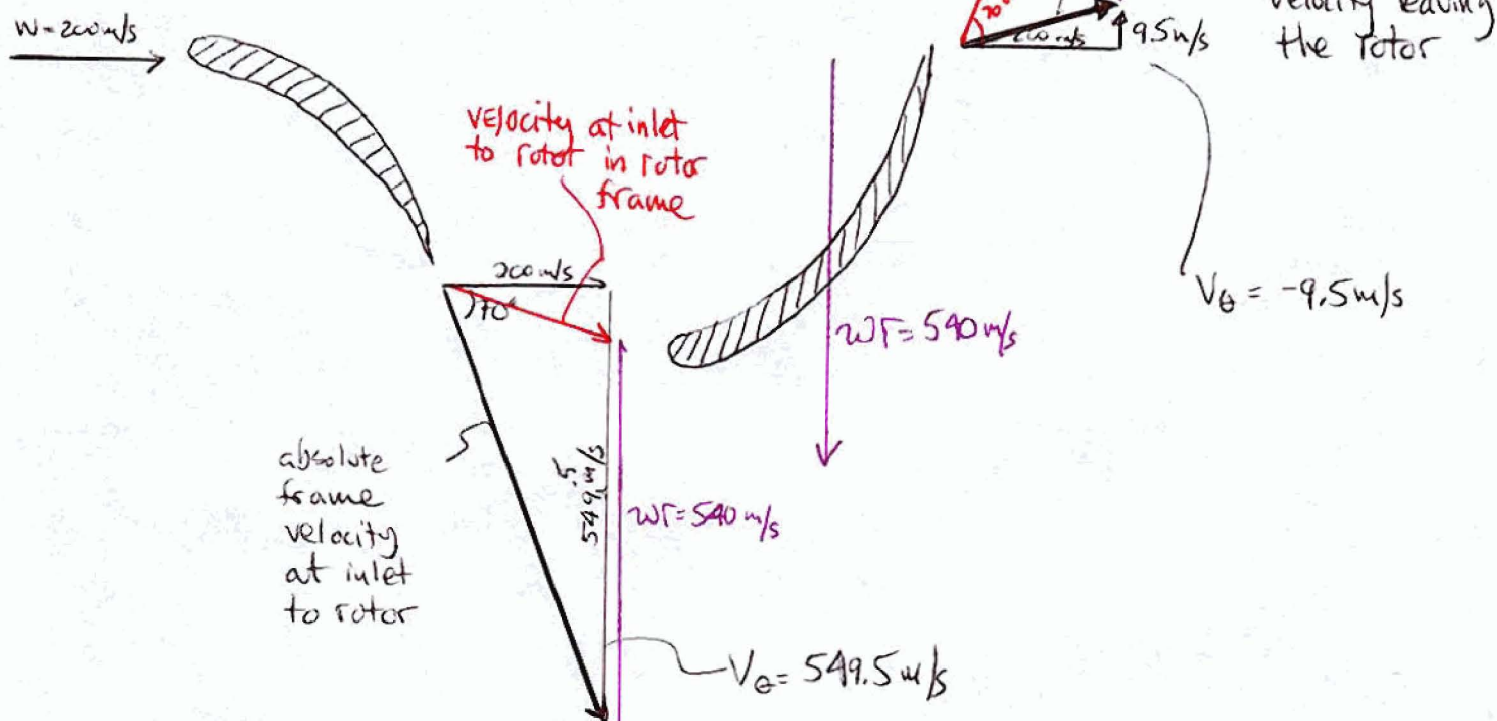
$$r = 1\text{m}$$

$$\dot{m} = 20\text{kg/s}$$

θ (+) in direction of rotor motion

STATOR

ROTOR



- b) THERE IS A TORQUE APPLIED ON BOTH BLADE ROWS. ~~ON~~ BOTH BLADE ROWS PRODUCE A CHANGE IN THE AXIAL FLUX OF TANGENTIAL MOMENTUM. THE TORQUE ON THE STATOR IS IN THE $+x$ DIRECTION $\uparrow$ FORCE UP THE TORQUE ON THE ROTOR ACTS IN THE $-x$ DIRECTION (FORCE IS DOWN $\downarrow$).

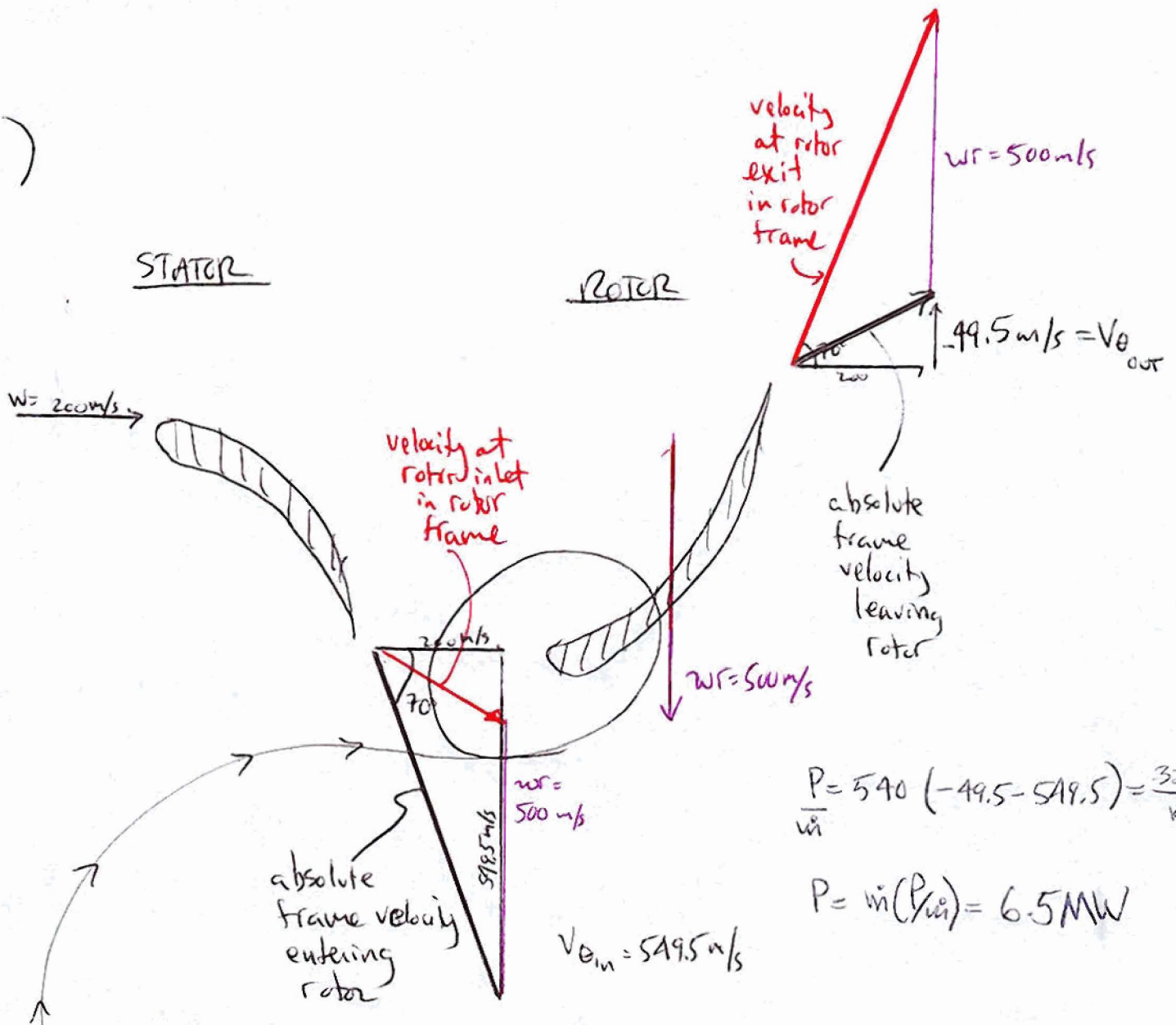
c) $P = \dot{m} T = 0$ FOR STATOR ($\omega = 0$)

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$$= \dot{m} \omega r (V_{\theta_{out}} - V_{\theta_{in}}) = 540 \cdot 20 (-9.5 - 549.5)$$

$$= 6 \text{ MW}$$

d)



THE POWER EXTRACTED INCREASES. NOTE THE ANGLE OF ATTACK FOR THE ROTOR HAS INCREASED. FLOW SEPARATION (STALL) MAY BE A PROBLEM.