HW #5

Chpt 2.4

Q1. Since \( E \) and \( A \) are constant, \( \Phi_E = \vec{E} \cdot \vec{A} \)

a) \( \Phi_E = (4 \hat{i}) \cdot (2 \hat{i} + 3 \hat{j}) = 8 \text{ Nm}^2/\text{C} \)

b) \( \Phi_E = (4 \hat{k}) \cdot (\ldots) = 0 \)

2. (a) \( \int \vec{d}A = a^2 \) \hspace{1cm} (b) \( \int \vec{d}A = \pi r^2 \) \hspace{1cm} (c) \( \int \vec{d}A = 2\pi rh \)

P1. \( \Phi_{\text{mass}} = \rho \Phi_{\text{volume}} = \rho \int \vec{v} \cdot d\vec{A} \) in general

   a) if \( \vec{v} = \text{const and parallel to } \hat{n} \) to area, Then

   \[ \Phi_{\text{mass}} = \rho \vec{v} \cdot A = \rho \vec{v} \cdot w d = (100)(0.207)(3.22)(1.04) \]

   \[ = 673 \text{ kg/s} \]

   b) same as in (a) since only \( A = w d \) has flux

   c) \( \frac{1}{2} \) answer to (a) since \( A = \frac{1}{2} w d \) \( \Rightarrow \Phi_{\text{mass}} = 347 \text{ kg/s} \)

   d) same as (c) since \( A \) with flux = \( \frac{1}{2} w d \) only

   e) answer to part (a) \( x \) cos \( 34^\circ = 575 \text{ kg/s} \)

3. \( \vec{A} = (1.4) \hat{j} \text{ in the right face} \)

   a) \( \vec{E} \cdot \vec{A} = 6 \hat{i} \cdot (1.4) \hat{j} = 0 \)

   b) \( = -2 \frac{1}{2} (1.4)^2 = -2(1.4)^2 = -2.92 \text{ Nm}^2/\text{C} \)

   c) \( (\frac{32}{4}) (3.4)^2 \hat{j} = 0 \)

   d) zero in all cases