

# AER210—Fluids

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September 10, 2021

## Contents

### 1 Tutorial 1

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- 15.1 #15

$$\int_1^4 \int_0^2 (6x^2y - 2x) dy dx \quad (1.1)$$

$$= \int_1^4 (12x^2 - 4x) dx \quad (1.2)$$

$$= (256 - 32) - (4 - 2) \quad (1.3)$$

$$= 222 \quad (1.4)$$

- 15.1 #29

$$\iint_R \frac{xy^2}{x^2 + 1} dA, R = \{(x, y) | 0 \leq x \leq 1, -3 \leq y \leq 3\} \quad (1.5)$$

$$= \int_0^1 \int_{-3}^3 \frac{xy^2}{x^2 + 1} dy dx \quad (1.6)$$

$$= 18 \int_0^1 \frac{x}{x^2 + 1} dx \quad (1.7)$$

$$= 18 \times \frac{1}{2} \log(x^2 + 1) \Big|_0^1 \quad (1.8)$$

$$= 9 \log 2 \quad (1.9)$$

- 15.1 #31

$$\iint_R x \sin(x + y) dA, R = [0, \frac{\pi}{6}] \times [0, \frac{\pi}{3}] \quad (1.10)$$

$$= \int_0^{\frac{\pi}{6}} \int_0^{\frac{\pi}{3}} x \sin(x + y) dy dx \quad (1.11)$$

$$= \int_0^{\frac{\pi}{6}} x \cos(x) - x \cos\left(x + \frac{\pi}{3}\right) dx \quad (1.12)$$

$$= x \left( \sin x - \sin\left(x + \frac{\pi}{3}\right) \right) \Big|_0^{\frac{\pi}{6}} - \int_0^{\frac{\pi}{6}} \sin x - \sin\left(x + \frac{\pi}{3}\right) dx \quad (1.13)$$

$$= \frac{\pi}{6} \left( \frac{1}{2} - 1 \right) - \left( -\cos x + \cos\left(x + \frac{\pi}{3}\right) \right) \Big|_0^{\frac{\pi}{6}} \quad (1.14)$$

$$= \frac{\sqrt{3} - 1}{2} - \frac{\pi}{12} \quad (1.15)$$