

Due Thursday, March 20, 2025.

Problem 1 (Thomas Problem §8.2 # 3). Integrate (parts)

$$\int t^2 \cos t \, dt.$$

Problem 2 (Thomas Problem §8.2 # 5). Integrate (parts)

$$\int_1^2 x \ln x \, dx.$$

Problem 3 (Thomas Problem §8.2 # 29). Integrate (substitution, then parts)

$$\int \sin(\ln x) \, dx.$$

Problem 4 (Thomas Problem §8.1 # 41). Integrate (complete the square)

$$\int \frac{dx}{(x+1)\sqrt{x^2+2x}}.$$

Problem 5 (Thomas Problem §8.1 # 47). Integrate (improper fractions)

$$\int \frac{x}{x+1} \, dx.$$

Problem 6. Integrate (improper fraction)

$$\int \frac{1+x}{1+x^2} \, dx.$$

Problem 7. Integrate (parts - let $u = \ln x$ and $dv = dx$).

$$\int \ln x \, dx.$$

Problem 8. Consider the integral

$$\int \tan x \sec^2 x \, dx.$$

- (a) Compute this using the substitution $u = \tan x$.
- (b) Compute this using the substitution $u = \sec x$.
- (c) Explain.

Problem 9. Consider the region R in the cartesian plane given as

$$R = \left\{ (x, y) \in \mathbb{R}^2 \mid x^2 \leq y \leq 1 - x^2 \right\}.$$

Let S be the solid obtained by revolving the region R about the x -axis.

- (a) Find the area of R .
- (b) Find the area of the largest circle in R .

Problem 10. Consider the region R in the cartesian plane given as

$$R = \left\{ (x, y) \in \mathbb{R}^2 \mid x \geq 1 \text{ and } 0 \leq y \leq \frac{1}{x} \right\}.$$

Let S be the solid obtained by revolving the region R about the x -axis.

- (a) Find the area of R .
- (b) Find the volume of S .