

Unit 01 - Essential problems

Shells

🔗 Shells volume - offset graph, y -axis

Consider the region in the first quadrant bounded by the lines $x = 0$, $x = 2$, $y = 0$, and the curve $y = \frac{1}{\sqrt{x^2+1}}$. Revolve this about the y -axis.

Find the volume of the resulting solid.

IBP

🔗 Integration by parts - A and T

Compute the integral:

$$\int x^2 \sin x \, dx$$

🔗 Integration by parts - A and L

Compute the integral:

$$\int x^3 \ln x \, dx$$

🔗 Integration by parts - A and I

Compute the integral:

$$\int \tan^{-1}(x) \, dx$$

Trig power products

🔗 Somewhat odd power product

Compute the integral:

$$\int \sin^2 x \cdot \cos^3 x \, dx$$

🔗 **Tangent and secant both even**

Compute the integral:

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

🔗 **All even power product**

Compute the integral:

$$\int \sin^4 x \cdot \cos^2 x \, dx$$

🔗 **Tangent and secant mixed parity**

Compute the integral:

$$\int \tan^3 x \sec^2 x \, dx$$

- (a) Using $du = \sec^2 x \, dx$.
- (b) Using $du = \sec x \tan x \, dx$.

Trig subs

🔗 **Trig sub**

Compute the definite integral:

$$\int_0^{1/2} \frac{x^2}{\sqrt{1-x^2}} \, dx$$

🔗 **Trig sub**

Compute the integral:

$$\int \frac{dx}{x^3 \sqrt{x^2 - 4}}$$

🔗 **Trig sub**

Compute the integral:

$$\int \frac{x^2}{(x^2 + 1)^{3/2}} dx$$

Partial fractions

✍ Distinct linear factors

Compute the integral:

$$\int \frac{1}{(x + 2)(x - 3)} dx$$

✍ Long division first

Compute the integral:

$$\int \frac{2x^3 + 3x^2 + 7x + 4}{x + 1} dx$$

✍ Partial fractions - linear and quadratic

Compute the integral:

$$\int \frac{5x^2 - 5x + 14}{(x - 2)(x^2 + 4)} dx$$

✍ Partial fractions - repeated factor

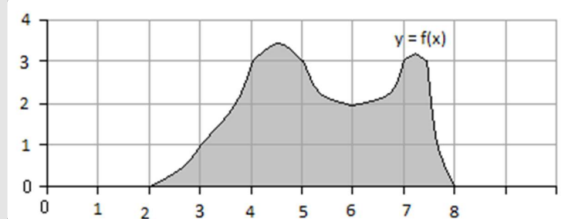
Compute the integral:

$$\int \frac{1}{x(x - 1)^3} dx$$

Simpson's Rule

✍ Simpson's Rule for volume by shells

Use Simpson's Rule with $n = 6$ to compute the volume of the solid obtained by revolving the pictured region about the y -axis. Can you do it without using a calculator?



☒ Area of a garden bed

The width of a garden bed is measured every 2 feet as shown. How much mulch (in cubic yards) should I buy to cover this garden bed with a 6-inch layer of mulch?

