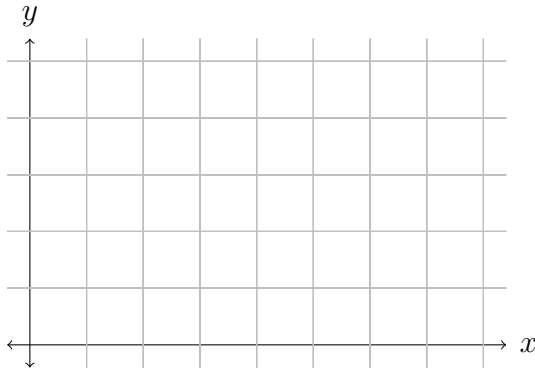


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1. Compute  $\int \cos(x) \sin^n(x) dx$ , where  $n$  is any positive integer.

2. Let  $f(x) = \sqrt{x}$ ,  $g(x) = x^2$  and  $h(x) = 2x$  for  $0 \leq x \leq 1$ .

(a) Draw the graphs of the functions on the given interval on the grid below.



(b) Find the area of the region with all three of these functions as its boundary on this interval.

3. (a) Explain, in your own words, the shell method of integration.

(b) Explain, in your own words, the disk / washer method of integration.

(c) Let  $S$  be the region bounded by  $y = \frac{1}{x+1}$  and  $y = 1 - \frac{x}{3}$ , and let  $V$  be the solid of revolution of  $S$  about the  $x$ -axis.

i. Use the shell method to determine  $V$ .

ii. Use the disk / washer method to determine  $V$ .

4. Set up, but do not evaluate the integral expressing the area between the circles  $x^2 + y^2 = 2$  and  $x^2 + (y + 1)^2 = 1$ .

5. **Bonus:** Find all continuous functions  $f(x)$  satisfying  $\int_0^x f(t) dt = (f(x))^2 + C$ .