Due Date: Wednesday, February 9 at 10AM EST

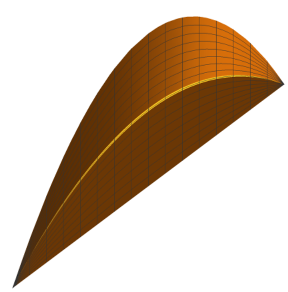
Carefully read and provide solutions to the problems below, showing all work required to justify any conclusions you make. You are encouraged to collaborate with your classmates, but all solutions turned in should be your own work. If you do collaborate, please record the names of those other students on your submitted work. Finally, your work should be submitted as a PDF on Canvas before the listed due date.

Textbook problems: Section 2.3 #14, 18, 22; Section 2.4 #14, 18, 20, 26; Section 2.5 #10, 18, 28, 30; Section 2.6 #16, 20, 34, 38

Optional textbook problems: the odd numbered problems from Sections 2.3 - 2.6

Problem 1. In Problem 5 on Classwork 2.3, you found the volume of the solid obtained by rotating a region A about the x-axis, where A is the region enclosed by $y = \ln(x), x = 2$ and the x-axis. Set up and evaluate a dy-integral computing the volume of the solid obtained by rotating the same region A *about the y-axis.*

Problem 2. Find the volume of the object S whose base is the region in the xy-plane enclosed by the parabola $y = 4 - x^2$ and the line $y = x + 2$. Cross sections of S are perpendicular to the x-axis and are isosceles triangles with height 3 times the base of the triangle; each triangle's base lies in the xy-plane. A graph of S is shown below.



(a) Sketch the base of S in the xy-plane. Clearly label all curves, intersection points, etc.

(b) Find the area function for each cross section.

(c) Set up and evaluate an integral representing the volume of S.

Problem 3. Which of the following figures have the same area? Why?

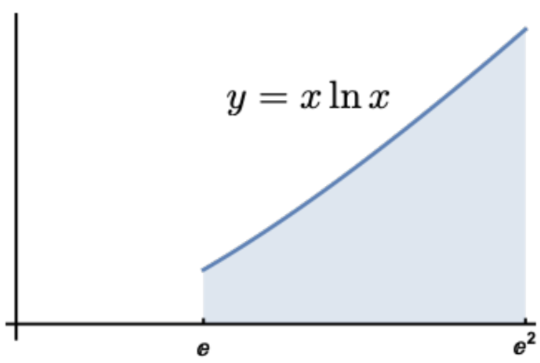


Figure 1

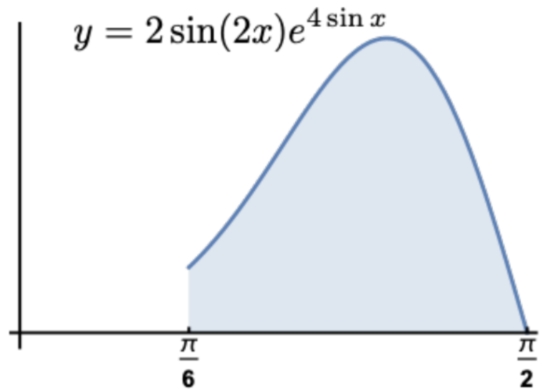


Figure 2

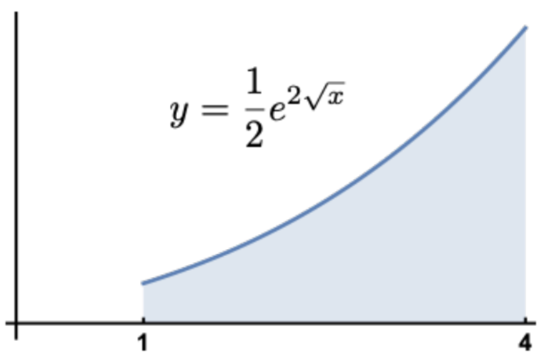


Figure 3

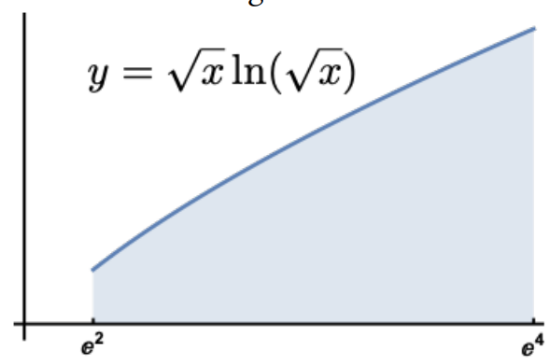


Figure 4

Problem 4. In this problem we will discuss approximate values of the definite integral below:

$$\int_1^2 e^{1/x}\,dx.$$

(a) Compute T_4.

(b) Find an upper bound for the error in your approximation in part (a).

(c) Can you conclude whether this is an overestimate or underestimate of the value of the integral. If so, which is it and why?

(d) How large do we have to choose n so that T_n is accurate to within 0.0001?

Problem 5. (EXTRA CREDIT, 5 points) Find the following indefinite integral:

$$\int \cos^2(x)\sin^4(x)\,dx.$$