

Math 106C
Calculus 2
Winter 2015
Exam 1
S. Balcomb

Please show your work.

1. The graph of a function, $f(x)$, is decreasing and concave down on the interval $[a,b]$. Put the following quantities in **increasing** order:

$$L_{100}, R_{100}, T_{100}, M_{100}, \int_a^b f(x) dx .$$

2. Let $I = \int_0^2 e^{x^2} dx$.

Write out and add up the four terms in the approximating sums:

a) L_4

b) R_4

3. Evaluate by finding an antiderivative. [Your final answer should not contain an integral]:

a) $\int x \sin(x^2) dx$

b) $\int \frac{e^x}{e^x + 4} dx$

4. Evaluate: $\int_0^1 \frac{1}{x^2 - 6x + 9} dx$

5. A cylindrical tank of radius 5 ft. and height 9 ft. is two-thirds filled with water. Find the work required to pump all the water over the upper rim.

6. a) Set up an integral that gives the arc length of the graph of

$$y = x^{3/2} \text{ from } x = 1 \text{ to } x = 2.$$

- b) Evaluate the integral in part (a)

7. If A is the region bounded by the graphs of $y = \sec(x)$, the x -axis, $x = 0$ and $x = \frac{\pi}{4}$, what is the volume of the solid formed when A is revolved around the x -axis?

8. Find the solution of the initial value problem:

$$y' + \frac{y^2}{x} = 0 \quad \text{with } y(1) = 2.$$

9. The graph of $\frac{x^2}{9} + \frac{y^2}{4} = 1$ is an ellipse with x-intercepts at ± 3 and y-intercepts at ± 2 .

a) Graph the ellipse.

b) Find the volume of the solid formed with the “top-half” of the ellipse is rotated around the x-axis.