

Math 1a – Review Problems

GSI: David Freeman

December 14, 2005

1. If $q(t)$ is the rate at which the average American consumes gas, in gallons per day, what is $\int_0^{365} q(t) dt$?
2. Evaluate $\int_0^1 e^x dx$ as the limit of a Riemann sum (i.e. do not use antiderivatives). You will need to use the formula for the sum of a geometric series:

$$a + a^2 + a^3 + \cdots + a^n = \frac{a^{n+1} - a}{a - 1}$$

3. Compute the following indefinite integral: $\int \frac{x+1}{x+2} dx$
4. Compute the following indefinite integral: $\int x^5 \sqrt[3]{x^3 + 1} dx$.
5. If $f(x) = \int_{e^x}^{x^3} \ln t dt$, compute $f'(x)$.
6. Let S be the doughnut-like shape obtained by revolving about the line $y = -2$ the region bounded by the curves $x = e^y$, $x = 10$, and $y = 0$. Set up two different integrals that give the volume of S : one using the method of discs and washers, and one using the method of cylindrical shells.
7. A kite 100 ft above the ground moves horizontally at a speed of 8 ft/s. At what rate is the angle between the string and the horizontal decreasing when 200 ft of string have been let out?
8. Find the points on the ellipse $4x^2 + y^2 = 4$ that are farthest away from the point $(1, 0)$.