

Topics	N1	C1	C2	N2	N3	C3	C4
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## Topic N1: Single-Variable Integration Techniques

**P1.** All these should be doable using substitution. If you don't get the right  $u$  the first time, try again until you do.

## Topic C1: Numerical Integration

## Topic C2: Multivariate Optimization

## Topic N2: Double Integrals and Total Differentials

## N3: Elementary Differential Equations and Applications

**P1.** If you can't tell right away what the answer is, go ahead and actually solve the differential equation and see what you get.

**P2.** These look big and intimidating, but really they are just the same thing as we've been doing dressed up with more difficult integrals. Use the method of integrating factors on each one, and keep trying till you get the integral right.

**P3.** You should have no trouble with these once you get the solutions to **P2**.

## C3: Numerical Differential Equations

**P1.**

- (a) This is just your standard Euler's method problem.
- (b) How do you numerically approximate integrals of functions? Use the plot points you obtained in part (a) to execute Simpson's rule.

**P2.** The difference is that my data point isn't at the beginning of the interval I want you to approximate over. The standard way works for the subintervals in  $[1, 2]$ , but for those in  $[0, 1]$ , you will have to do Euler's method backwards. Recall the derivation of Euler's method in terms of linear approximation, and figure out how to go left with the line, rather than right.

**P3.** Apply the method from **P2**..

**P4.** Apply the method from **P2**..

**P5.** Apply the method from **P2**..

**P6.** Write the logistic equation with the given  $k$  and  $N(t)$ . Now, you know that  $y(0) = 16$  from the problem. Is this one third of  $N(0)$ ? If so, 0 is the answer; if not, 0 is not the answer, so you will have to numerically approximate  $y(1)$  and  $N(1)$  to make the same comparison. Continue in this manner until you find the correct number of days.

## **C4: The Calculus of Probability**