18.01, Oct. 8, 2003 Recitation Suggestions

1. Do a little calculation of diff. Maybe do an "implicit diff." example, e.g. if $x^2+y^2=1$, then $dy = -\frac{x}{y}dx$. If $x = \frac{2t}{t^2+1}, y = \frac{t^2-1}{t^2+1}$, for instance, get $d(\frac{t^2-1}{t^2+1}) = -\frac{2t}{t^2-1}d(\frac{2t}{t^2+1})$ (which is true)

2. Do lots of examples of antideriv's and make students do them

i) $\int \sqrt{x^3+3x^2+1}\bullet(x^2+2x)dx$

ii) $\int (1+x+x^2+x^3+...)dx$ and use to explain lin+quadratic expansion of $\ln(\frac{1}{1-x}) = x+\frac{x^2}{2}+\frac{x^3}{3}+...$ (probably takes too much time)

iii) $\int (\sqrt{x}+\frac{1}{\sqrt{x}})dx$, could be directly or sub $U = x^{\frac{1}{2}}$, $dU = \frac{1}{2\sqrt{x}}dx$ so $= \int (U^2+1)2dU = 2(\frac{U^3}{3}+U)+C = \frac{2}{3}x^{\frac{3}{2}}+2x^{\frac{1}{2}}+C$

iv) $\int \frac{\sin(x)}{\cos(x)}dx, U = \cos(x), \rightarrow \ln|U| = lm|\cos(x)|+C.$

v) Maybe do a ln problem where C becomes a constant inside, i.e. $\frac{d}{dx}\ln(2x) = \frac{1}{x}$.

vi) $\int xe^{-x^2/2}dx$, if really ambitious $\int xe^{-tx^2/2}dx = ... = -\frac{1}{t}e^{-tx^2/2}$ and diff. W.R.T. "var" t to get formulas for $\int x^{2k+1}e^{-tx^2/2}dx$ (instead of integ. by parts).