Instructions

1. Introduce yourselves! Despite popular belief, math is in fact a team sport!
2. Find some blackboard space, a piece of chalk, and decide who will be your first scribe.
3. Do the problems below, having a different person be the scribe for each one.

1A Review

1. Find $\lim_{x\to\infty} \sqrt{\frac{16x^3+2x-1}{4x^3+1} - e^{-x}}$
2. Differentiate each of the following:
   - $(x^3+2)(x^6-10)$
   - $\frac{3x-1}{2x+1}$
   - $xe^{\sin(x)}$
3. Find each of the following:
   - $\int x^4 + \cos(x)dx$
   - $\int \tan\theta \ln(\sin\theta)d\theta$
   - $\int \frac{dx}{x\ln x \ln(\ln x)}$
   - The area under the curve $y = xe^{x^2}$ between $x = 0$ and $x = 2$

Integration By Parts

1. Find each of the following:
   (a) $\int_1^4 \sqrt{t}\ln(t)dt$
   (b) $\int_1^e x^3\ln(x)dx$
   (c) $\int \sin(x)\cos(x)\ln(\sin(x))dx$
   (d) $\int_0^{\sqrt{3}} \tan^{-1}(1/x)dx$
2. What's wrong with the following "proof" that 0=1?
$$\ln x = \int \frac{1}{x} \underset{u=\frac{1}{x}, dv=dx}{=} \frac{1}{x}x - \int -\frac{1}{x^2}x = 1 + \int \frac{1}{x} = 1 + \ln x$$
3. Find $\int e^{ax}\sin x dx$, where a is any real number.
4. As we said in class, when doing integration by parts you don't need to worry about the +C when finding v from dv. Try to convince yourself that this is true by computing $\int xe^x dx$ and taking $v = e^x + C$.
5. Suppose we know $\int f(x)dx = F(x) + C$. Find $\int f(\sqrt{x})dx$.