Warm-Up Problems
January 31, 2003

1. Let $f(x) = x^3$. Compute the following. Think about what is happening geometrically as well.

   (a) $\int_{-1}^{1} f(x)\, dx$
   Solution: 0

   (b) $\int_{-1}^{1} |f(x)|\, dx$
   Solution: $\frac{1}{2}$

   (c) $\int_{-3}^{1} f(x)\, dx$
   Solution: -20

   (d) $\int_{-1}^{3} |f(x)|\, dx$
   Solution: $\frac{41}{2}$

2. Compute the following integrals:

   (a) $\int_{0}^{\pi/2} \cos x \sqrt{\sin x}\, dx$
   Solution: $\frac{2}{3}$

   (b) $\int_{1}^{4} \frac{((1+\sqrt{x})^4}{\sqrt{x}}\, dx$'
   Solution: $\frac{422}{5}$

   (c) $\int_{0}^{\pi/6} \sin 2x \cos^3 2x\, dx$
   Solution: $\frac{15}{128}$

   (d) $\int \tan x\, dx$
   Solution: $-\ln|\cos x| + C$

   (e) $\int \frac{x}{\sqrt{1-9x^4}}\, dx$
   Solution: $\frac{1}{9}\sin^{-1}(3x^2) + C$

Hints: for number 2d, try $u = \cos x$. For number 2e, try $u = 3x^2$. Why do these work?