These problems review some material from Calculus I. You will work on them in groups today, and turn the papers in at the end of the section. Solutions will be posted.

1. (a) Sketch the graph of the function $f(x) = \frac{1}{x}$.

(b) What do the quantities $\int_1^2 f(x) \, dx$, $\int_{-2}^{-1} f(t) \, dt$ represent in terms of this graph?

(c) Determine $a$ so that $\int_1^a f(x) \, dx = 1$.

(d) Determine $b$ so that $\int_b^{-1} f(x) \, dx = 1$.

2. Evaluate the integral $\int_0^1 x\sqrt{1-x^4} \, dx$ by first making a substitution and then interpreting the integral as an area which you know.
3. Evaluate the following
(a) \( \int \sin(2x) \, dx \)

(b) \( \int x \cos(x^2) \, dx \)

(c) \( \int \frac{x}{x^2 - 1} \, dx \)

(d) \( \int \frac{1}{x^2 + 1} \, dx \)

4. The region under the graph of \( y = \sin(x^2) \) between \( x = 0 \) and \( x = \sqrt{\pi} \) is shown below. Set up, but do not evaluate, integrals which represent the volume of the solid formed when

(a) The region is rotated about the \( x \)-axis.

(b) The region is rotated about the \( y \)-axis.