1. Calculate four of the following integrals:

$$\int x\cos x^2\,dx\,;\quad \int x^2\cos x^2\,dx\,;\quad \int x^2\cos x\,dx\,;\quad \int x^2\cos^2 x\,dx\,;\quad \int x\cos^2 x\,dx\,.$$

Comment Most people use *many* parentheses and rewrite the integrands to decrease possible confusion. So $\underline{x^2\cos^2 x}$ becomes $\underline{x^2(\cos x)^2}$ and $\underline{x^2\cos x^2}$ becomes $\underline{x^2\cos(x^2)}$.

2. a) Find $\int \frac{e^{2x}}{\sqrt{e^{2x}+1}}dx$.

b) Find $\int \frac{e^{x}}{\sqrt{e^{2x}+1}}dx$.

Comment These antiderivatives may appear similar, but different methods are needed.

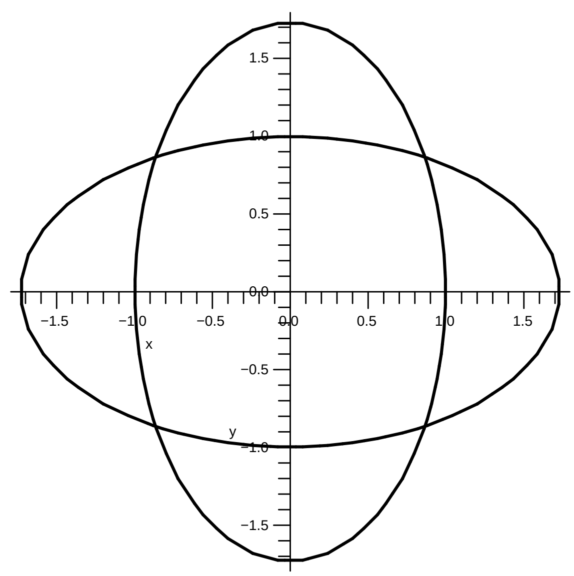
3. a) For x near 0, $\sin x$ is well-approximated by its tangent line at $x=0$. What is this tangent line?

b) Approximation over an interval is preferred over approximation near a point for many purposes. One criterion for assessing the accuracy of such an approximation is *mean-square error*. The mean-square error between a straight line $y=Ax$ going through the origin and the function $\sin x$ over the interval $[0,1]$ is given by the definite integral $\int_0^1 (\sin x - Ax)^2\,dx$. Find the A which <u>minimizes</u> this integral.

Hint Expand the integrand, compute the integral, and find the A minimizing the result.

c) Sketch $\sin x$ and the straight lines found in a) and b) on the unit interval $[0,1]$.

4. Calculate the area inside both of the ellipses $\frac{x^2}{3}+y^2=1$ and $x^2+\frac{y^2}{3}$.



One problem will be selected for a writeup to be handed in at the next recitation meeting. Please see Professor Greenfield's Math 152 webpage <u>for this semester</u> to learn which problem to hand in.