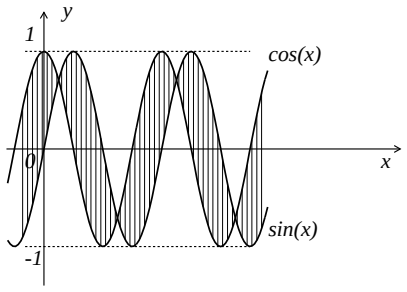
Physics 3513, Homework #6 (due 10/15)

The numbers in parentheses after the problem number indicate points for each problem.

P1(10) Find the ratio of the hatched area to the area of the band $|y| < 1$.



P2(20) (Boas 2.42,44) Find (a) the volume, and (b) the mass of the solid between the planes $z = 2x + 3y + 6$ and $z = 2x + 7y + 8$, and over the square $0 < x < 1$, $0 < y < 1$ if the density is proportional to y.

P3(30) (Boas 3.17-19) For the curve $y = \sqrt{x}$ between $x = 0$ and $x = 2$, find (a) the area under the curve, (b) the arc length, and (c) the volume of the solid generated when the area is revolved around the x axis.

P4(10) (Boas 4.11) Evaluate a triple integral in cylindrical coordinates for the volume inside the cylinder $x^2 + y^2 = 4$ and between $z = 2x^2 + y^2$ and the (x, y) plane.

P5(10) (Boas 4.16) Find the Jacobian for transformation $x = \frac{1}{2}(u^2 - v^2)$, $y = uv$.

P6(10) (Boas 5.1) Find the area of the plane $x - 2y + 5z = 13$ cut out by the cylinder $x^2 + y^2 = 9$.

P7(10) Find the volume of the solid between the planes

$$\begin{aligned} a_1x + b_1y + c_1z &= \pm h_1 \\ a_2x + b_2y + c_2z &= \pm h_2 \\ a_3x + b_3y + c_3z &= \pm h_3 \end{aligned} .$$

Hint: make a change of variables to simplify the triple integral; use the fact that $\dfrac{\partial(x,y,z)}{\partial(x',y',z')} = \left[\dfrac{\partial(x',y',z')}{\partial(x,y,z)}\right]^{-1}$.