Turn in the following problems at the start of your Thursday recitation section. To receive full credit, please staple your work, and put your name, your section number, and the homework number at the top.

(1-2) Determine whether each integral converges or diverges. If the integral converges find its value.

1. $\displaystyle\int_1^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}}\,dx$

2. $\displaystyle\int_{-1}^1 \frac{e^x}{e^x-1}\,dx$

(3-4) Use the Comparison Theorem for integrals to determine whether the integrals below are convergent or divergent.

3. $\displaystyle\int_1^\infty \frac{2+e^{-x}}{x}\,dx$

4. $\displaystyle\int_0^\pi \frac{\sin^2 x}{\sqrt{x}}\,dx$

5. A radioactive substance decays exponentially: The mass at time t is $m(t) = m(0)e^{kt}$, where $m(0)$ is the initial mass and k is a negative constant. The *mean life*, M, of an atom in the substance is
$$M = -k\int_0^\infty te^{kt}\,dt.$$
For the radioactive carbon isotrope ^{14}C, used in radiocarbon dating, the value of k is -0.000121. Find the mean life of a ^{14}C atom.

6. Sketch the curves $y = \cos x$ and $y = 1 - \cos x$ on the interval $[0, \pi]$, and observe that the region between them consists of two separate parts. Find the area of this region.

7. Find the area of the region bounded by the graphs of $4x + y^2 = 12$ and $y = x$.

8. Find the volume of the solid obtained by rotating the region bounded by the graphs of $x = y^2$ and $x = 1$ about the line $x = 1$.

9. Find the volume of the solid obtained by rotating the region bounded by the graphs of $y = x^3$ and $y = \sqrt{x}$ about the line $y = 1$.

10. Find the volume of the following solid S. The base of S is the region enclosed by the parabola $y = 1 - x^2$ and the x-axis. Cross-sections of S, perpendicular to the x-axis, are isosceles triangles with height equal to the base (here the base of each triangular cross-section is assumed to be a line-segment in the base of S).

11. A wedge is cut out of a circular cylinder of radius 4 by two planes. One plane is perpendicular to the axis of the cylinder. The other intersects the first at an angle of 30° along a diameter of the cylinder. Find the volume of the wedge.