1. Find the area of the region bounded by $y = e^x$, $y = e^{-x}$, $x = -2$, and $x = 1$.

2. Find the volume of the solid obtained by rotating the region bounded by $y = x^2 - 1$, $y = 0$, $x = 1$, $x = 2$ about the x-axis.

3. Find the volume of the solid obtained by rotating the region bounded by $y = x^2$, $y = 0$. $x = 1$, $x = 2$ about

(a) the y-axis

(b) $x = 4$

4. The base of solid S is the triangular region with vertices (0,0), (2,0), and (0,1). Cross-sections perpendicular to the x-axis are semicircles. Find the volume of S.

5. A heavy rope, 50 ft long, weighs 0.5 lb/ft and hangs over the edge of a building 120 ft hight. How much work is done in pulling the half rope to the top of the building?

6. A spring has a natural length of 20 cm. If a 25-N force is required to keep it stretched to a length of 30 cm, how much work is required to stretch it from 20 cm to 25 cm?

7. A tank in a shape of a sphere of radius 9 m is half full of water. Find the work W required to pump the water out of the spout, if the height of the spout is 3 m.

8. Find the average value of $f(x) = \sin^2 x \cos x$ on $[-\pi/2, \pi/4]$.

9. Evaluate the integral

   (a) $\displaystyle\int t^2 \cos(1 - t^3) dt$

   (b) $\displaystyle\int \frac{x^2}{\sqrt{1-x}} dx$

(c) $\int x^3 \sqrt{x^2 + 5} \; dx$

(d) $\int \dfrac{\sin^3 x}{\sec^4 x} \; dx$

(e) $\int x^3 e^{x^2} dx$

(f) $\displaystyle\int_0^{\pi/8} \sin^2(2x)\cos^3(2x)\ dx$

(g) $\displaystyle\int \sin^2 x \cos^4 x\ dx$

(h) $\displaystyle\int_0^{\pi/4} \tan^4 x \sec^2 x\ dx$

(i) $\displaystyle\int \tan x \sec^3 x \ dx$

(j) $\displaystyle\int \sin 3x \cos x \ dx$