1. A 15 foot long trough with semicircular ends of radius 4 ft is full of water. Find the work done in pumping the water out of the tank. The weight density of water is $\rho g = 62.5$ pounds per cubic foot.

2. The base of a solid is the triangle with vertices $(0, 0)$, $(0, 4)$, and $(2, 0)$. Cross-sections perpendicular the the $x$-axis are semicircles. Find the volume of the solid.

3. Find the volume of the solid formed by rotating the region bounded by $y = \sin x$, $y = 0$ on the interval $[0, \frac{\pi}{2}]$ about the $x$-axis.

4. Find the volume of the solid formed by rotating the region bounded by $y = e^x$, $y = 0$, $x = 0$, and $x = 1$ about the line $x = 3$.

5. Consider the region $R$ bounded by $y = \tan x$, $y = 0$, and $x = \frac{\pi}{4}$.
   (a) Find the area of this region.
   (b) Find the volume of the solid obtained by rotating the region about the $x$-axis.

6. Find $\int e^{5x} \sin x \, dx$

7. Consider the region bounded by $y = 5x - x^2$ and $y = 2x$. Set up integrals to find...
   (a) the volume obtained by revolving this region about the line $y = 9$.
   (b) the volume obtained by revolving this region about the line $x = -2$.

8. A spring has a natural length of 1 m. The force required to keep it stretched to a length of 2 m is 10 N. Find the work required to stretch the spring from a length of 2 m to a length of 4 m.

9. Find the area between the curves $y = 5 - x^2$, $y = 4x$ on the interval from $x = 0$ to $x = 2$.

10. A 15 pound rope, 30 feet long, hangs from the top of a cliff. How much work is done in pulling 1/3 of this rope to the top of the cliff?

11. Find the average value of $f(x) = \sec^4 x$ over the interval $[0, \frac{\pi}{4}]$.

12. Consider the region bounded by the curves $x = 4 - y^2$ and $x = y^2 + 2$.
   (a) Find the area of this region.
   (b) Find the volume of the solid obtained by rotating this region about the $y$-axis.
   (c) Find the volume of the solid obtained by rotating this region about the line $y = -2$.

13. Find the volume of the solid obtained by revolving the region bounded by $y = 4 - x^2$ and $y = 3$ about the $x$-axis.

14. Integrate the following.
   (a) $\int \sin^4 x \cos^5 x \, dx$
   (b) $\int_1^e x^2 \ln(x) \, dx$
   (c) $\int \frac{x^3}{\sqrt{x^2 + 1}} \, dx$
   (d) $\int \sec^5 x \tan^3 x \, dx$
   (e) $\int \arccos x \, dx$