1. Evaluate the definite integral $\int_0^{\pi/4} \sec^2 x e^{\tan x} dx$.

2. Evaluate the definite integral $\int_0^1 \frac{x\,dx}{\sqrt{1+x^2}}$.

3. Evaluate the indefinite integral $\int x^5 \sqrt{x^3+1}\,dx$

4. Evaluate the definite integral $\int_0^{\pi/8} \sin(2x)\cos(2x)\,dx$.

5. Evaluate the indefinite integral $\int \frac{\sec\theta\ \tan\theta\,d\theta}{4+\sec\theta}$.

6. Evaluate the indefinite integral $\int x^3 \ln x\,dx$.

7. Evaluate the definite integral $\int_1^{\sqrt{3}} \arctan\left(\frac{1}{x}\right)\,dx$.

8. Evaluate the indefinite integral $\int (x^3+x^2+x+1)e^x\,dx$.

9. Evaluate the definite integral $\int_0^{\pi} \sin(2x)e^{\cos x}\,dx$.

10. Evaluate the indefinite integral $\int e^{2x}\sin(2x)\,dx$.

11. Find the area between the curves $y = x^2+1$ and $y = x+3$ when $0 \le x \le 3$.

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

13. Find the volume of the solid generated by rotating a plane region bounded by $y = 6x - x^2 - 8$ and the line $y = -1$ about the indicated line.

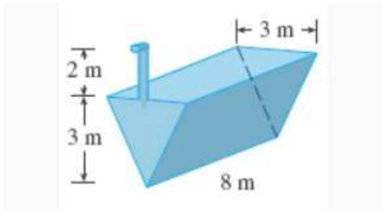
    a) the y-axis
    b) $x = 1$
    c) $y = 2$
    d) $x = -2$
    e) $y = -4$

14. A cable 40 feet long weighing 6 pounds per foot is hanging off the side of a 50 foot tall building. At the bottom of the cable is a bucket of rocks weighing 100 pounds. How much work is required to pull 10 feet of the cable to the top of the building?

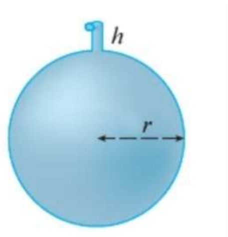
15. A spring has a natural length of 20 cm. If a 10 J work is required to keep it stretched to a length 25 cm, how much work is done in stretching the spring from 30 cm to 80 cm?

16. A spring has a natural length of 20 cm. If a force on 12 N is required to hold the spring stretched to a length of 40 cm, find the work required to stretch the spring from 30 cm to 70 cm.

17. An 8 meter long tank in the shape of a triangular trough is full of water. Its vertical cross sections are isosceles triangles with base equal to its height of 3 meters.There is a 2 meter spout at the top of the tank. Set up the integral to find the work required to pump out the top 1.5 meters of water from the tank.



18. A spherical tank with a radius r of 5 meters is completely full of water. The tank has a 0.5 meter spout h at the top.



(a) Set up an integral to find the work required to empty the full tank of water.

(b) Set up an integral to find the work required to empty only half the tank of water.

(c) If you initially started out with only half a tank of water, set up an integral to find the work required to empty the tank.