1. Let R denote the region in the Cartesian plane bounded by $y = x^3, x = 0, x = 1$ and $y = 0$. Compute the volume obtained by revolving R about the line $x = 24$.

2. Let R denote the region in the Cartesian plane bounded by $y = \sqrt{x}$ and $y = x^2$. Compute the volume obtained by revolving R about the y-axis.

3. A rectangular swimming pool 20 m long and 8 m wide has a sloping plane bottom so that thte depth of the pool is 1 m at one end and 3 m at the other end. Find the total work which must be done to pump all the water our of this pool when it is full over the top edge of the pool.

4. Let R denote the region in the Cartesian plane contained inside the circle

$$(x-2)^2 + y^2 = 1.$$

Compute the volume of the region obtained by rotating R about the y-axis.

5. A tank of height 10 is filled with water to height 5. The tank is an inverted cone with radius 3 at the top. Find the work in Joules required to pump out the tank.

6. Set

$$f(x) = \int_{x^2}^{2x} e^{t^2}\, dt.$$

Compute $f'(2)$.