1. *Find the surface area of the spherical cap obtained by rotating around the x-axis the curve described parametrically by* $y = a\sin\theta$, $x = a\cos\theta$, $0 \leq \theta \leq \pi/6$ *(for any constant* $a > 0$*).*

2. *Let* S *be the surface obtained by rotating the curve* $y = \sqrt{x}$, $2 < x < k$ *about the x-axis. Choose* k *such that the area of* S *is equal to* $\frac{98\pi}{6}$*.*

3. *A bag of sand originally weighing* $144lb$ *was lifted at a constant rate. As it rose, sand also leaked out at a constant rate. The sand was half gone by the time the bag had been lifted to* $18ft$*. How much work was done lifting the sand bag this far? (Neglect the weight of the bag annd lifting equipment.)*