Here are some interesting problems you can solve using the techniques in §§ 6.2, 6.3, and 9.2.

1. Let $r$ and $h$ be positive constants. If the triangle bounded by the $x$-axis, the $y$-axis, and the lines $y = \frac{r}{h}x$ and $x = h$ is revolved about the $x$-axis, the resulting solid is a (right circular) cone with radius $r$ and height $h$.

   Use an integral (with either disks or shells) to derive the formula for the volume of a cone with radius $r$ and height $h$.

2. Find a formula for the surface area of a cone with radius $r$ and height $h$.

3. A sphere of radius $R$ can be viewed as a solid of revolution: take the area under the curve $y = \sqrt{R^2 - x^2}$ between $x = -R$ and $x = R$, and revolve it about the $x$-axis.

   You can now use an integral to derive the formula for the volume of a sphere of radius $R$. Stewart does this using the disk method in Example 1 of § 6.2. Try to get the same result using the shell method.

4. Find a formula for the surface area of a sphere of radius $R$.

5. A *bead* is a sphere with a cylindrical hole drilled through its center. A bead is determined by two dimensions: the radius of the sphere (which we will denote $R$) and the radius of the hole (which we will denote $r$). To construct a bead as a solid of revolution, take the region bounded by the curve $y = \sqrt{R^2 - x^2}$, the curve $y = -\sqrt{R^2 - x^2}$, and the line $x = r$, and revolve it about the $y$-axis.

   Use the shell method to find a formula for the volume of a bead with sphere radius $R$ and hole radius $r$.

   (Your answer should be a constant multiple of $(R^2 - r^2)^{3/2}$. Where does this dimension appear in the bead? See § 6.3, Problem 44.)