1) Let $R$ be the region of the $x$-$y$ plane bounded by $y = \sqrt{x}$ and $y = \frac{1}{2}x$. Compute
\[ \iint_R (x^2 + y^2) \, dA \]
in two different ways. Simplify your answers as much as possible.

2) Let $R$ be the region of the $x$-$y$ plane bounded by $x = -\sqrt{4 - y^2}$ and the $y$-axis. Compute
\[ \iint_R e^{2x^2 + 2y^2} \, dA \]

3) Compute
\[ \int_0^2 \int_y^2 \cos(x^2) \, dx \, dy \]

4) Find the volume bounded by
- $x^2 + y^2 = 4$
- $x^2 + y^2 + z^2 = 9$
- $x^2 + y^2 + (z - 10)^2 = 9$

5) Consider a right circular cone (i.e., a standard ice cream cone) whose height is $h$ and whose base radius is $a$. Use a double integral to prove that the volume $V$ of this cone is
\[ V = \frac{\pi}{3} a^2 h \]

(Hint: To get started, consider the general equation of a cone, given in Table 1 on page 824. Manipulate this general equation to obtain the specific cone you desire.)