You have 10 minutes for the following problems. Calculators are NOT allowed (they are useless anyway). Please print your name and section number at the top-right corner before you start.

**Problem 1** (5 points) Change the order of the following integral. You should not evaluate this integral.

\[
\int_0^1 \int_{-y}^{1-y} e^{x^{100}+\sqrt{y}} \, dx \, dy
\]

\[
\left( \int_{-1}^0 \int_{-x}^0 + \int_0^1 \int_0^{1-x} \right) e^{x^{100}+\sqrt{y}} \, dy \, dx
\]

**Problem 2** (5 points) Set up the integral to find the volume of an ice-cream cone, which is bounded by \(9x^2 + 9y^2 - z^2 = 0\) from below and the upper hemisphere of \(x^2 + y^2 + (z-3)^2 = 1\) from above. You should not evaluate this integral.

1. Notice that any \(z\)-section is a circle. By symmetry, we only need to set up the integral for a quarter of a circle. Suppose the radius is \(r\).

\[
\text{Area of the section: } 4 \int_0^r \int_0^r (r^2-x^2) \, dy \, dx
\]

2. The vertical section suggests that the radius changes first as \(9r^2+y^2=0\) or \(r=\frac{y}{3}\), then as \(r^2+(y-3)^2=1\). So the volume

\[
4 \left( \int_0^3 \left[ \frac{1}{3} \int_0^{\sqrt{9r^2-y^2}} \sqrt{9r^2-y^2} - y^2 \right] \, dy \, dr + \int_0^3 \int_0^{\sqrt{9r^2-(y-3)^2}} \frac{4}{3} \left[ \sqrt{1-(y-3)^2} \right] \, dy \, dr \right)
\]