# INTEGRAL CALCULUS. SECOND MIDTERM

***In the following problems you are required to show all your work and provide the necessary explanations to get full credit. Only scientific calculators with no graphing capabilities are allowed.***

**1.** (3.25 POINTS) Compute the volume of the solid

$$A = \{(x, y, z) \in \mathbb{R}^3 : \, 2x^2 + y^2 \leq z \leq 2 - x^2 - y^2\}.$$

**2.** (3.25 POINTS) Evaluate the integral $\displaystyle\int_B x^2 y^2 z \, dxdydz$, where

$$B = \{(x, y, z) \in \mathbb{R}^3 : \, x^2 + y^2 \leq z^2 \leq 3x^2 + 3y^2; \; x^2 + y^2 + z^2 \leq 1; \; z \geq 0\}.$$

**3.** (3.5 POINTS) Evaluate the integral $\int_R e^{x-3y} \cos^2(\pi(x+y))dxdy$, where $R$ is the parallelogram with vertices $(1, 0)$, $(4, 1)$, $(\frac{7}{4}, \frac{-3}{4})$ and $(\frac{19}{4}, \frac{1}{4})$ by making a change of variables $(x, y) = \varphi(u, v)$ that maps a rectangle $S$ in the $uv$-plane (where the sides of $S$ are parallel to the u- and v-axes) onto the parallelogram $R$ in the $xy$-plane.