Exam III   Math 232, Calculus III, Spring 2016   Name:

Show all work to receive full credit.

1. Evaluate

   (a) $\int_1^3 \int_0^1 (1 + 4xy)\, dx\, dy$

   (b) $\int_1^2 \int_0^3 \frac{xe^x}{y}\, dx\, dy$

   (c) $\int\int y^2\, dA$ where $D = \{(x, y) \mid -1 \le y \le 1, -y - 2 \le x \le y\}$

2. Evaluate (by changing the order of integration)

   (a) $\int_0^1 \int_x^1 e^{x/y}\, dy\, dx$

   (b) $\int_0^8 \int_{\sqrt[3]{y}}^2 e^{x^4}\, dx\, dy$

3. Evaluate (by converting to polar)

   (a) $\int\int_D (x^2 + y^2)^{3/2}\, dA$, where D is the region in the first quadrant bounded by lines $y = 0$ and $y = \sqrt{3}x$, and the circle $x^2 + y^2 = 9$.

   (b) $\int_{-2}^2 \int_0^{\sqrt{4-x^2}} xy^2\, dy\, dx$

4. Set up but do not evaluate the triple integral to find the volume of the solid tetrahedron which is bounded by $3x + y + z = 1$ and the coordinate planes (i.e., the first octant). Evaluate.

5. Evaluate $\int\int\int_E yz \cos(x^5)\, dV$ where $E = \{(x, y, z) \mid 0 \le x \le 1, 0 \le y \le x, x \le z \le 2x\}$

6. Set up the integral $\int\int\int_E x - y\, dV$, where E is the solid that lies between cylinders $x^2 + y^2 = 1$ and $x^2 + y^2 = 16$, above the xy plane and below $z = y + 4$. Evaluate for practice.

7. Find the volume of the solid using spherical coordinates that lies above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = 4$. Hint will be given in class.

8. Evaluate the integral $\int\int_R \frac{x - 2y}{3x - y}$ by making the change of variables $u = x - 2y$ and $v = 3x - y$ where R is the parallelogram enclosed by the lines $x - 2y = 0$, $x - 2y = 4$, $3x - y = 1$, and $3x - y = 8$.

9. Evaluate the integral $\int\int_R (x - 2y)^9 (3x - y)^7\, dA$ by making the change of variables $u = x - 2y$ and $v = 3x - y$ where R is the parallelogram enclosed by the lines $x - 2y = 0$, $x - 2y = 4$, $3x - y = 1$, and $3x - y = 8$.