

Calculus 3 — Exam 3
MAT 309, Fall 2016 — D. Ivanišić

Name: _____
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1. (18pts) Find $\iint_D \frac{1}{x} dA$ if D is the triangle bounded by lines $x = 1$, $y = x - 1$ and $y = 7 - 3x$. Sketch the region of integration first.

2. (18pts) Let D be the region bounded by the curves $y = x^3$, $x = 2$ and $y = 0$. Sketch the region and set up $\iint_D \frac{1}{(x^4 + 1)^2} dA$ as iterated integrals in both orders of integration. Then evaluate the double integral using the easier order. Sketch the region of integration first.

3. (18pts) Use polar coordinates to find $\iint_D \frac{x}{x^2 + y^2} dA$, if D is the region inside the circle $(x - 1)^2 + y^2 = 1$ and outside the circle $x^2 + y^2 = 1$. Sketch the region of integration first.

4. (18pts) Sketch the region E that is bounded by the planes $z = 0$, $z = \frac{\pi}{3}$ and the parabolic cylinder $x = 9 - y^2$. Then write the two iterated triple integrals that stand for $\iiint_E f dV$ which end in $dy dz dx$ and $dx dz dy$.

5. (10pts) Find the cylindrical and spherical coordinates of the point whose cartesian coordinates are $(-\sqrt{6}, \sqrt{6}, 2)$.

6. (18pts) Use either cylindrical or spherical coordinates to set up $\iiint_E x^2 + z^2 dV$, where E is the region inside the sphere $x^2 + y^2 + z^2 = 16$ and above the cone $x^2 + y^2 = z^2$. Simplify the expression but do not evaluate the integral. Sketch the region E .

Bonus (10pts) Find the volume of the solid that is inside both cylinders: $x^2 + y^2 = 1$ and $y^2 + z^2 = 1$.