Print your first and last name legibly above the line:

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Calculus III

Professor Piotr Hajłasz

Second Second Exam

November 16, 2015.

Problem	Possible points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Problem 1. Evaluate the integral $\iiint_T x^2\,dV$, where T is the solid tetrahedron with vertices $(0,0,0)$, $(1,0,0)$, $(0,1,0)$ and $(0,0,1)$.

Problem 2. Evaluate the integral

$$\int_0^2 \int_0^{\sqrt{4-x^2}} \int_0^{\sqrt{4-x^2-y^2}} z^2 \sqrt{x^2+y^2+z^2}\, dz\, dy\, dx.$$

Problem 3. Rewrite the integral

$$\int_0^1 \int_{\sqrt{x}}^1 \int_0^{1-y} f(x,y,z)\,dz\,dy\,dx \quad \text{as} \quad \int_?^? \int_?^? \int_?^? f(x,y,z)\,dy\,dz\,dx.$$

Problem 4. Find a function f such that $\mathbf{F} = \nabla f$ and use it to evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$, where $\mathbf{F}(x, y, z) = yze^{xz}\,\mathbf{i} + (e^{xz} + e^{y})\,\mathbf{j} + (xye^{xz} + 2z)\,\mathbf{k}$ and C is parametrized by $\mathbf{r}(t) = (t^2 + 1)\,\mathbf{i} + (t^2 - 1)\,\mathbf{j} + (t^2 - 2t)\,\mathbf{k}$, $0 \leq t \leq 2$.

Problem 5. Use Green's theorem to evaluate $\int_C xy^2\,dx + 2x^2y\,dy$, where C is the positively oriented triangle with vertices $(0,0)$, $(2,2)$ and $(2,4)$.