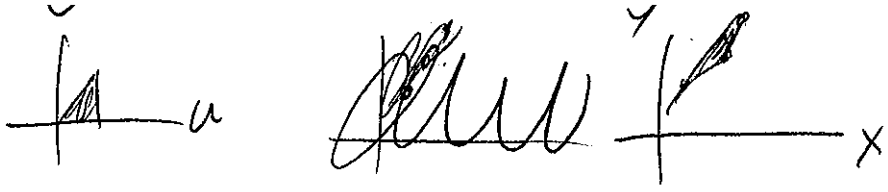
MATH 2242-090 — Spring 2016 — Dr. Clontz — Quiz 9

Name: Solutions

- Each quiz question is labeled with its worth toward your total quiz grade for the semester.
- On multiple choice problems, you do not need to show your work. No partial credit will be given.
- On full response problems, show all of your work and give a complete solution. When in doubt, don't skip any steps. Partial credit will be given at the discretion of the professor.
- This quiz is open notes and open book.
- This quiz is due at the end of class. Quizzes submitted over one minute late will be penalized by 50%.



1. (10 points) The affine transformation $\mathbf{T}(u,v) = (4u+2v+1, u+2v+3)$ transforms the unit triangle with vertices $(0,0),(1,0),(1,1)$ in the uv plane into the triangle R with vertcies $(1,4),(4,5),(5,7)$ in the xy plane. Compute $\iint_R x-y\,dA$.

$$\frac{\partial T}{\partial u} = \det\begin{pmatrix} 4 & 2 \\ 1 & 2 \end{pmatrix} = 8-2=6$$

$$= \iint_D \Big((4u+2v+1)-(u+2v+3)\Big)(6)\,dA$$

$$= \int_0^1 \int_0^u (3u-2)(6)\,dv\,du$$

$$= \int_0^1 \int_0^u (18u-12\,dv\,du$$

$$= \int_0^1 18u^2-12u\,du$$

$$= \Big[6u^3-6u^2\Big]_0^1 = (6-6)-(0-0) = \boxed{0}$$

2. (10 points) Which of these iterated integrals gives the volume of a cone of height $\sqrt{3}$ and radius 1? (Hint: Draw the cone with its tip at the origin and the center of its base on the positive z axis.)

- ○ $\int_{-1}^{1}\int_{-\sqrt{1-x^2}}^{\sqrt{1-x^2}}\int_{\sqrt{3x^2+3y^2}}^{\sqrt{3}} 1\;dzdydx$
- ○ $\int_0^{2\pi}\int_0^1\int_{\sqrt{3}r}^{\sqrt{3}} r\;dzdrd\theta$
- ○ $\int_0^{2\pi}\int_0^{\pi/6}\int_0^{\sqrt{3}\sec\phi} \rho^2\sin\phi\;d\rho d\phi d\theta$
- ● All of these
- ○ None of these