Minitest 4 - MTH 2410

Dr. Graham-Squire, Fall 2012

Name: ________________________________

I pledge that I have neither given nor received any unauthorized assistance on this exam.

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(*signature*)

DIRECTIONS

1. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.
2. Clearly indicate your answer by putting a box around it.
3. Computers are not allowed on any part of this test. Calculators <u>are</u> allowed on all other parts of the test. Even on questions where technology is allowed, you should still show all of your work (which means showing your work for any integral you evaluate).
4. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.
5. Make sure you sign the pledge.
6. Number of questions = 7. Total Points = 40.

1. (5 points) TRUE OR FALSE. Circle the correct answer. If false, give a counterexample or explain (briefly) why it is false. If true, no explanation is necessary (though if you are wrong, an explanation can get you some partial credit).

   (a) **True or False:** If C is given by $x(t) = t$, $y(t) = t$, $0 \le t \le 1$, then

$$\int_C xy\, ds = \int_0^1 t^2\, dt$$

   (b) **True or False:** If you calculate a surface integral of the function 1 over the surface S, you get the surface area of S.

For questions 2 to 5, use any appropriate technique to find the value of the given line integral. There will often be multiple ways to get to the correct answer, though one way is usually easier than the others. Make sure to explain your reasoning and show your work!

2. (6 points) Evaluate the line integral where C consists of the line segments from (0,0) to (3,2) and from (3,2) to (4,0).

$$\int_C (xy - 1)\, dx \ + (\frac{1}{2}x^2 - 2y + \cos(y))\, dy$$

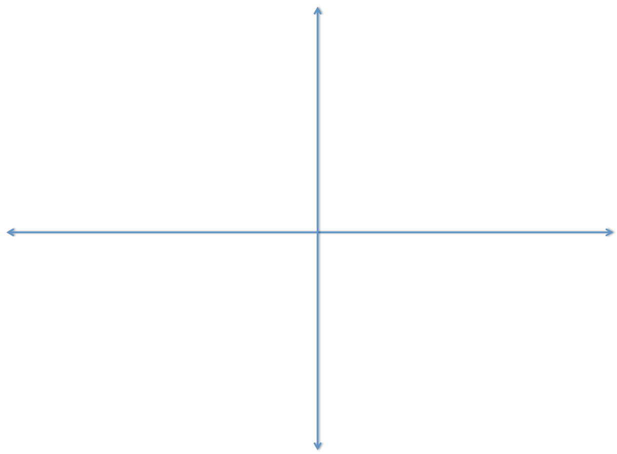
3. (6 points) Find the work done by the force field $\mathbf{F}(x, y, z) = \mathbf{i} + z\,\mathbf{j} + y\,\mathbf{k}$ when a particle moves along the path defined by $x = \cos t, y = \sin t$, and $z = t^2$ where $0 \leq t \leq \pi$.

4. (6 points) Evaluate the line integral $\int_C (3x^2 - 2y)\,dx + (3x - y^2 \sin(y))\,dy$ over the curve C given by the rectangle of height 2 and base 4, with its base on the positive x-axis and its left side on the positive y-axis.

5. (6 points) Evaluate $\int_C \mathbf{F} \cdot d\mathbf{r}$ where $\mathbf{F} = \langle e^x + 6xy, \sin y + 3x^2 \rangle$ and C is given by

$$\mathbf{r}(t) = \cos(t)\mathbf{i} + 2\sin(t)\mathbf{j}.$$

for $0 \leq t \leq 2\pi$.



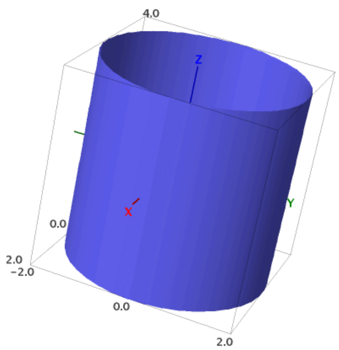
6. (4 points) Match the equation to the graph.

(a) $\mathbf{r}(u, v) = \langle 4\cos(u)\cos(v), 4\sin(u)\cos(v), 4\sin(v)\rangle$

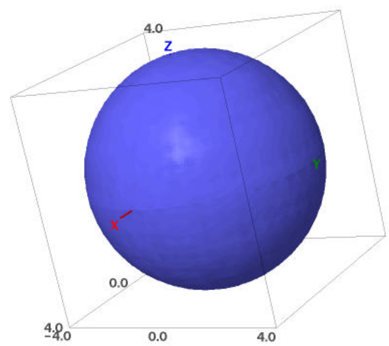
(b) $\mathbf{r}(u, v) = \langle u + 2, (v + u)/4, v\rangle$

(c) $\mathbf{r}(u, v) = \langle 2\cos(u), 2\sin(u), v\rangle$

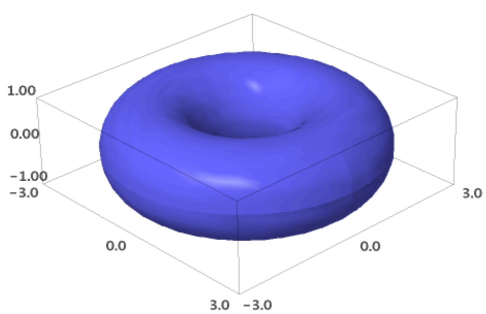
(d) $\mathbf{r}(u, v) = \langle (2 + \cos(u))\cos(v), (2 + \cos(u))\sin(v), \sin(u)\rangle$



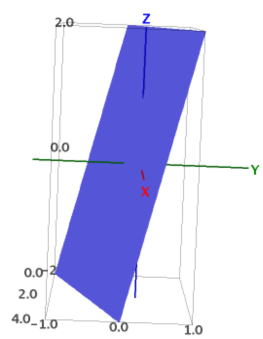
(i)



(ii)



(iii) ______



(iv)

7. (7 points) Evaluate the surface integral $\iint\limits_S z\,dS$, where S is the hemisphere of radius 2 lying above the xy-plane.

Extra Credit(1 point) True or False: If $\int_C \mathbf{F}\cdot d\mathbf{r} = 0$, then $\mathbf{F}$ and $d\mathbf{r}$ are orthogonal.