Fall 2020 ENG 5300 Test 1 Yufan Lu

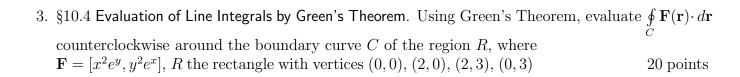
You must show **all** work to receive full credit. All work is to be your own.

Oct 19 2020
This is a closed books and notes test. Be organized. Total points: **100**Submit to BB a single b/w pdf file, named using your last name. emailed solutions won't be graded

1. §10.1 Line Integral. Work done by a force. Calculate $\int_C \mathbf{F}(\mathbf{r}) \cdot d\mathbf{r}$ for the following data. If \mathbf{F} is a force, this gives the work done in the displacement along C. (Show the details.) $\mathbf{F} = [x - y, y - z, z - x], C : \mathbf{r} = [2\cos t, t, 2\sin t]$ from (2, 0, 0) to $(2, 2\pi, 0)$.

2. $\S10.2$ Show that the form under the integral sign is exact in space and evaluate the integral. Show the details of your work.

$$\int_{(0,1,0)}^{(1,0,1)} (e^x \cosh y \, dx + (e^x \sinh y + e^z \cosh y) \, dy + e^z \sinh y \, dz)$$



4. §10.6 Flux Integrals (3) $\iint_S \mathbf{F} \cdot \mathbf{n} \, dA$ Evaluate the integral given below for the following data. Indicate the kind of surface. (Show the details of your work.) 20 points $\mathbf{F} = [0, x, 0], \ S: \ x^2 + y^2 + z^2 = 1, \ x \ge 0, \ y \ge 0, \ z \ge 0$

 $5.~\S 10.7$ Application of the Divergence Theorem: Surface Integrals $\oiint_{\mathbf{S}} \mathbf{F} \cdot \mathbf{n} \, dA$

20 points

Evaluate the surface integral by the Divergence Theorem. Show the details.

 $\mathbf{F} = [e^x\,,\,e^y\,,\,e^z],\;\;S$ the surface of the cube $|x| \leq 1,\,|y| \leq 1,\,|z| \leq 1$

6. §10.9 Evaluation of $\oint_C \mathbf{F} \cdot \mathbf{r}' \, ds$

20 points

Calculate this line integral by Stokes's theorem for the given \mathbf{F} and C. Assume the Cartesian coordinates to be right-handed and the z-component of the surface normal to be nonnegative. Show the details.

$$\mathbf{F} = [z^3, \, x^3, \, y^3], \ \ C \text{ the circle } x = 2, \, y^2 + z^2 = 9$$

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