Math 3330 - Final Review

The final exam will include topics from Test 1 and Test 2. For example there will be an extremma problem and a tangent plane problem. The only additional topics not on Test 1 or Test 2 are below.

1 Line Integrals

1. $\int_C x\,dx$. Let C be line segment from $(0,1)$ to $(3,2)$.

2. $\int_C xy\,ds$. Let C be line segment from $(0,1)$ to $(3,2)$.

3. $\int_C \langle -x, y\rangle \cdot d\mathbf{r}$. Let C be line segment from $(0,1)$ to $(3,2)$.

4. $\int_C x\,dy$. Let C be line segment from $(0,1)$ to $(3,2)$.

5. $\oint_C xy\,dx$. Let C be outside of the triangle traced from $(0,0)$ to $(0,2)$ to $(1,2)$ and then back to $(0,0)$.

6. $\oint_C \langle -x, y\rangle \cdot d\mathbf{r}$. Let C be outside of the triangle traced from $(0,0)$ to $(0,2)$ to $(1,2)$ and then back to $(0,0)$.

7. $\oint_C \langle 1, xy\rangle \cdot d\mathbf{r}$. Let C be the circle $x^2+y^2=4$ traced counter-clockwise.

8. $\oint_C -x+yds$. Let C be the circle $x^2+y^2=4$ traced counter-clockwise.

2 Green's Theorem

9. $\oint_C \langle x, -y\rangle \cdot d\mathbf{r}$. Let C be outside of the square traced from $(0,0)$ to $(0,2)$ to $(1,2)$ to $(1,0)$ and then back to $(0,0)$.

10. $\oint_C \langle e^{x^3} - xy, e^{y^3} - y\rangle \cdot d\mathbf{r}$. Let C be outside of the triangle traced from $(0,0)$ to $(0,2)$ to $(1,2)$ and then back to $(0,0)$.

11. $\oint_C \langle \cos(x^2)+y, \cos(y^2)+xy\rangle \cdot d\mathbf{r}$. Let C be the circle $x^2+y^2=4$ traced counter-clockwise.

3 Div/Grad/Curl

12. Define

$$f(x,y,z) = x^3 - yz^2 \text{ and } \mathbf{F}(x,y,z) = \langle x^3, yz^2, xy\rangle.$$

Compute the following, if possible, and if not possible state why.

(a) $\text{div}(f(x,y,z))$

(b) $\text{grad}(f(x,y,z))$

(c) $\text{curl}(f(x,y,z))$

(d) $\text{div}(\mathbf{F}(x,y,z))$

(e) $\text{grad}(\mathbf{F}(x,y,z))$

(f) $\text{curl}(\mathbf{F}(x,y,z))$

(g) $\nabla \cdot \mathbf{F}(x,y,z)$

(h) $\nabla \times (\nabla \cdot \mathbf{F}(x,y,z))$

(i) $\nabla \times (\nabla f(x,y,z))$