Math 17: Study Guide for Test 3

Know how to:

Use the Fundamental Theorem of Work Integrals
Use Green’s Theorem
Parametrize surfaces (graph of a function, sphere, and “cylindrical” cases)
Compute \( \frac{\partial \mathbf{r}}{\partial u} \times \frac{\partial \mathbf{r}}{\partial v} \) and \( \left\| \frac{\partial \mathbf{r}}{\partial u} \times \frac{\partial \mathbf{r}}{\partial v} \right\| \)
Compute \( \int_S f(x, y, z) \, dS \), for \( \mathbf{r}(u, v) \), graph of a function, and spheres
Use surface integrals to find surface area
Find the positive orientation on a parametrized surface
Compute the flux of a vector field \( \Phi = \int_S (\mathbf{F} \cdot \mathbf{n}) \, dS \)
Compute the divergence and curl of a vector field
Use Gauss’ Divergence Theorem to compute \( \int_S (\mathbf{F} \cdot \mathbf{n}) \, dS \), for closed surfaces

Be able to PROVE:

The parts of the Conservative Vector Field Theorem proved in class

Be Able to STATE:

Fundamental Theorem of Work Integrals,
Green’s Theorem
Gauss’ Divergence Theorem

Practice Problems:

Page 1122 #13, 15, 20
Page 1129 #9, 21
Page 1045 #3, 6a, 25, 42, 43
Page 1135 #5, 9, 10, 29
Page 1144 #5, 10, 13, 16
Page 1099 #16
Page 1152 #8, 10, 15

Answers to Even Numbered Problems

Page 1122: 20. \( \frac{\pi^3}{2} + 1 \)
Page 1045: 6a. \( x = u, y = 1 - u, z = v; -1 \leq v \leq 1, \quad 42. \frac{\sqrt{2}}{12} \pi^3 \)
Page 1135: 10. \( \frac{8}{3} \pi a^4 \)
Page 1144: 10. \( 4\pi \), 16. \( 8\pi \)
Page 1099: 14. \( \text{div} \, \mathbf{F} = ye^y + \sin y + 2 \sin z \cos z \), \( \text{curl} \, \mathbf{F} = -xe^{xy} \mathbf{k} \)
Page 1152: 8. \( \frac{3\pi^2}{2} \), 10. \( \frac{1}{24} \)

Study your class notes and homework. Good luck on Friday!