Equation Sheet Exam 3
Math 2153 Spring 2022

Changing between Cartesian/Spherical Coordinates:

$$\text{x} = \rho \sin\phi \cos\theta$$
$$\text{y} = \rho \sin\phi \sin\theta$$
$$\text{z} = \rho \cos\phi$$
$$\text{dV} = \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$$
$$\rho^2 = x^2 + y^2 + z^2$$

Change of Variables: $\iint_R f(x,y)dA = \iint_S f(g(u,v), h(u,v))|J(u,v)|dA$

Circulation: $\int_C F \cdot T ds = \int_C F \cdot r'(t)dt$

Flux: $\int_C F \cdot n \, ds = \int_C F \cdot \langle y'(t), -x'(t)\rangle dt$

Green's Theorem - Circulation: $\oint_C F \cdot T ds = \oint_C f dx + g dy = \iint_R \frac{\partial g}{\partial x} - \frac{\partial f}{\partial y} dA$

Green's Theorem - Flux: $\oint_C F \cdot n ds = \oint_C f dy - g dx = \iint_R \frac{\partial f}{\partial x} + \frac{\partial g}{\partial y} dA$