Some Formulas You Should Know
Math 21D, Fall 2019

Suppose $C : \mathbf{r}(t), a \le t \le b$ is a parametrized curve.

$$\mathbf{v}(t) = \mathbf{r}'(t) \qquad \text{velocity}$$

$$\mathbf{a}(t) = \mathbf{r}''(t) \qquad \text{acceleration}$$

$$L = \int_a^b |\mathbf{r}'(t)|\, dt \qquad \text{arclength}$$

$$\mathbf{T}(t) = \frac{\mathbf{r}'(t)}{|\mathbf{r}'(t)|} \qquad \text{unit tangent vector}$$

$$\kappa(t) = \frac{|\mathbf{T}'(t)|}{|\mathbf{r}'(t)|} = \left|\frac{d\mathbf{T}}{ds}\right| \qquad \text{curvature}$$

$$\mathbf{N}(t) = \frac{\mathbf{T}'(t)}{|\mathbf{T}'(t)|} = \frac{1}{\kappa}\frac{d\mathbf{T}}{ds} \qquad \text{unit normal vector}$$

Other formulas for curves will be given if needed. You should know how to define work, circulation, and flux as line integrals.

Green's theorem:

$$\int\int_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) dxdy = \oint_C (M\, dx + N\, dy)\,.$$