Study guide for quiz 10

Quiz problems include both the lecture contents and homework problems.

1. Section 15.8:

   Study the meaning of the Jacobian and memorize the formula both in double and triple integration.

2. Section 15.8:

   Assume that a change of variables between (x, y, z) and (u, v, w) is given, study how to change the lower and upper limits of integration for (x, y, z) into lower and upper limits of integration for (u, v, w). See the examples in section 15.8.

3. Section 16.1, 16.2: All exam problems will be expressed in explicit mathematical symbols. So you do not need to memorize the definitions of first moments, center of mass and moments of inertia, etc. in Section 16.1 and work, circulation, flow and flux in Section 16.2 in preparing the exams.

4. Section 16.1, 16.2:

   Study the meanings of

$$\int_C f(x, y, z)\, ds,$$

$$\int_C \boldsymbol{F}(x, y, z) \cdot \boldsymbol{T} ds = \int_C \boldsymbol{F}(x, y, z) \cdot d\boldsymbol{r} = \int_C M(x, y, z)\, dx + N(x, y, z)\, dy + P(x, y, z)\, dz,$$

$$\int_C \boldsymbol{F}(x, y) \cdot \boldsymbol{n}\, ds = \oint_C M(x, y)\, dy - N(x, y)\, dx$$

   and how to calculate them using a properly chosen parametrization of C: $\boldsymbol{r}(t)$, $t_0 \le t \le t_1$.

   A few points to pay attention:

   Which of them is (are) independent of the orientation of C? Which of them depend(s) on the orientation of C?

   How do you choose the parametrization $\boldsymbol{r}(t)$ so that the direction of $\boldsymbol{T}$ comply with the orientation of C?

   How is the outward normal $\boldsymbol{n}$ related to $\boldsymbol{T}$ if the parametrization of C is increasing in the counter-clockwise direction?