# Study guide for quiz 11

Quiz problems include both the lecture contents and homework problems.

1. 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.

2. Section 16.1, 16.2:

   Study the meanings of

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

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

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

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

   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?

3. Section 16.3, Part I:

   Study and memorize the definitions of 'path independent', 'conservative' and 'potential function' (p984).

   Study the statement and proof of Theorem 1:'Fundamental Theorem of Line Integrals' (p985).