

Total score: 11 points

March Boedihardjo © 2021

- Write your solutions on some papers. Scan as a pdf/jpg file(s). Upload the pdf/jpg file(s) as CCLE Assignment Quiz 4 before the end time.
- Open book. Calculators are not prohibited. But you cannot get any help from other people.
- You may compute any integral using Fundamental Theorem of Calculus without using the definition involving Riemann sum.
- If your final answer is a number, have it in 6 decimal places.
- You may use calculator to compute an integral like $\int_0^1 \int_0^{2x} \int_x^{x+y} x + y + z \, dz \, dy \, dx$ without showing your work for computing such integral. But you cannot use calculator to compute an integral like $\int_D 1 \, d(x, y)$ or $\int_0^1 \int_0^1 \int_{[x,y]} x + y + z \, dz \, dy \, dx$ or an integral involving min/max without showing your work. If your set up (that can be put into calculator) is correct but get the incorrect final answer, 0.5 point deducted, even if you carelessly make the wrong input into the calculator.
- Recommended: After submission, logout and log in CCLE. See if your file is there; download the file you submitted and check if it is the file you intended to submit.

1. (2 points) Consider the conservative vector field $F(x, y, z) = \begin{bmatrix} y + 3z \\ x + 2z \\ 2y + 3x \end{bmatrix}$ with domain \mathbb{R}^3 . Find a potential function of F .

2. (9 points) Consider the surface

$$\mathcal{S} = \{(x, y, z) \mid x = y^2 + z^2, x \leq 1\}.$$

(i) Find a parametrization of \mathcal{S} and write down the domain of the parametrization.

(ii) Find the tangent plane of \mathcal{S} at the point $\begin{bmatrix} 0.05 \\ 0.1 \\ 0.2 \end{bmatrix}$.

Write your answer in the form $\left\{ \begin{bmatrix} x \\ y \\ z \end{bmatrix} \mid ax + by + cz = d \right\}$.

(iii) Calculate $\int_{\mathcal{S}} xy^2 \, d(x, y, z)$.

End of exam