Prof. Yen-Chieh Huang
Dept of Electrical Engineering
National Tsing-Hua University

office: Delta 856
ext: 62340
email:ychuang@ee.nthu.edu.tw

EE214000 Electromagnetics, Fall 2020

Your name: _____ ID: _____   Sep. 21, 2020

EE214000 Electromagnetics, Fall, 2020
Quiz #3-1, Open books, notes (32 points), due 11 pm, Wednesday, Sep. 23, 2020
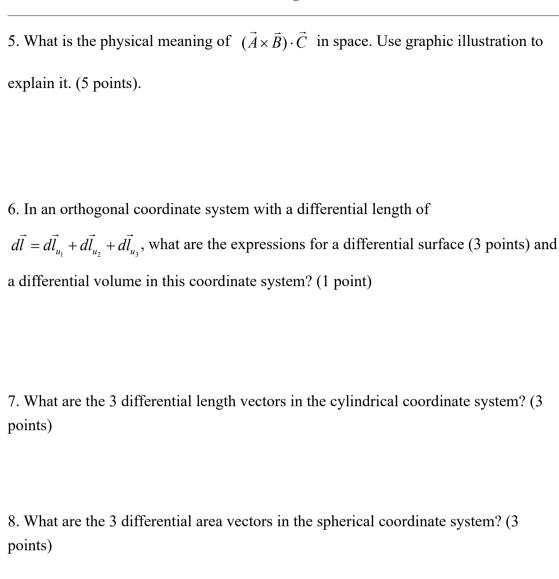(email solutions to 劉峰麒 alex851225@gmail.com)

Late submission won't be accepted!

1. Given a vector, $\vec{A}$, how do you calculate its unit vector? (1 point) Suppose $\vec{B} = 2\hat{a}_x + 4\hat{a}_y + 4\hat{a}_z$, what is its unit vector? (1 point)

2. In the *x-y* plane, assume $\vec{A} = \hat{a}_x + 3\hat{a}_y$ and $\vec{B} = 2\hat{a}_x + \hat{a}_y$. Explain that the calculation $\vec{C} = \vec{A} + \vec{B} = (1+2)\hat{a}_x + (3+1)\hat{a}_y = 3\hat{a}_x + 4\hat{a}_y$ is consistent with the head-to-tail construction for $\vec{C}$ in the *x-y* plane. (5 points)

3. What is the physical meaning of the scalar product of a vector $\vec{A}$ and an unit vector $\hat{a}_u$ or $\vec{A} \cdot \hat{a}_u$? Use graph illustration to explain it. (3 points)

4. What is the area of the parallelogram expanded by the two vectors, $\vec{l}_A = \hat{a}_x + 3\hat{a}_y$ (*m*) and $\vec{l}_B = 2\hat{a}_x + \hat{a}_y$ (*m*) ? (3 points)

Prof. Yen-Chieh Huang   office: Delta 856
Dept of Electrical Engineering   ext: 62340
National Tsing-Hua University   email:ychuang@ee.nthu.edu.tw
EE214000 Electromagnetics, Fall 2020

5. What is the physical meaning of $(\vec{A} \times \vec{B}) \cdot \vec{C}$ in space. Use graphic illustration to

explain it. (5 points).

6. In an orthogonal coordinate system with a differential length of

$d\vec{l} = d\vec{l}_{u_1} + d\vec{l}_{u_2} + d\vec{l}_{u_3}$, what are the expressions for a differential surface (3 points) and

a differential volume in this coordinate system? (1 point)

7. What are the 3 differential length vectors in the cylindrical coordinate system? (3 points)

8. What are the 3 differential area vectors in the spherical coordinate system? (3 points)

9. Use vector calculus to calculate the surface area of a sphere with radius of a. (2 points)

10. Use vector calculus to calculate the volume of a sphere with radius a. (2 points)