Striker Hall
10/30/20
Phys 330

Reading Quiz #1 Electro Magnetic Theory

1. $a(\bar{B}+\bar{C}) = a\bar{B} + a\bar{C}$

$B = B_x\hat{i} + B_y\hat{j} + B_z\hat{K}$

$C = C_x\hat{i} + C_y\hat{j} + C_z\hat{K}$ $\quad a(B_x+B_y+B_C+C_x+C_y+C_z)$

$= (B_xa + B_ya + B_Ca) + (C_xa + C_ya + C_za)$

$a(B_x+B_y+B_z) + a(C_x+C_y+C_z)$

$\boxed{= a\bar{B} + a\bar{C}}$ ✓

2). $\nabla(f(x,y) + \nabla g(x,y)$

Unable to distribute gradient over parenthesis. Cant add gradients if Im not mistaken only take dot and crossproduct of them.

3). $f(x,y) = x\hat{i} + y\hat{j}$ has zero curl x & y plane

$\nabla = \frac{d}{dx}\hat{i} + \frac{d}{dy}\hat{j} + \frac{d}{dz}K$ $\quad \nabla \cdot F = \frac{d}{dx}(x) + \frac{d}{dy}(y)$

$\nabla \cdot \bar{F} = 1+1$

$\nabla \cdot F = 2$ $\boxed{\text{divergence} = 2}$

curl $\nabla \times F = \det$ $\hat{i}$ $(\underset{u_1}{x}, \underset{u_2}{y}, \underset{u_3}{0}), (\underset{v_1}{\frac{d}{dx}}, \underset{v_2}{\frac{d}{dy}}, \underset{v_3}{\frac{d}{dz}})$

$\hat{i}\left(y\frac{d}{dz} - (0)\frac{d}{dy}\right) \hat{j}\left(0\frac{d}{dx} - x\frac{d}{dz}\right) \hat{K}\left(x\frac{d}{dy} - y\frac{d}{dx}\right)$

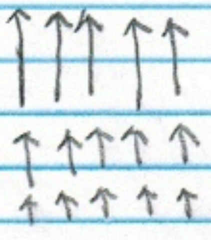
$\hat{i}(0) - \hat{j}(0) + \hat{K}(0) = 0$ $\boxed{\text{no curl}}$

$f(x,y) = x+y$

$x = r\cos(t)$
$y = r\sin(t)$

radius $=1$

figure 1.18



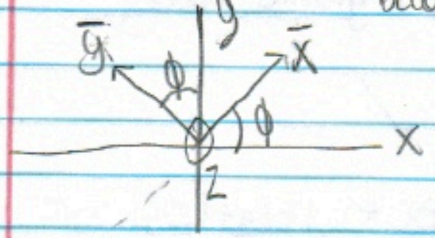
line integral $= \int_0^{2\pi} r\cos(t) + r\sin(t)$

$\int_0^{2\pi} \cos(t) + \sin(t)$

$\sin(t) - \cos(t) \Big| =$

$\sin(2\pi - \cos(2\pi) \Big| = 0$

2).



because were rotating along z axis, ax & ay are changing

$\bar{a}x$ = $\cos\phi$ $\sin\phi$
$\bar{a}y$ $-\sin\phi$ $\cos\phi$

$\bar{a}_x = a_x\cos\phi + a_y\sin\phi$
$\bar{a}_y = -a_x\sin\phi + a_y\cos\phi$

$\bar{a}_x^2 + \bar{a}_y^2 = a_x^2 + a_y^2$

$\bar{a}_x^2 = a^2_x\cos^2\phi + a_y^2\sin^2\phi + 2a_xa_y\cos\phi\sin\phi$

$\bar{a}_y^2 = a^2_x\sin^2\phi + a_y^2\cos^2\phi - 2a_xa_y\sin\phi\cos\phi$

$\boxed{\bar{a}_x^2 + \bar{a}_y^2 = a^2_x + a_y^2}$ magnitude is preserved

$|\bar{a}| = |a|$ ✓

3). $\int(\nabla \times v)\cdot da = \oint_P v\cdot dl$

Because the shere is has a radius of one and because it is closed, per the corollary 2 from the textbook for any closed surface, since the boundry line shrinks down to a point, the right side of the equation vanishes hence the result of $\int_S (\nabla \times \bar{v})\cdot da$

$da = 0$ therefore the entire integral $= 0$

4). $f(x) * g(x) = \dfrac{f(x) - g(x)}{f(x) + g(x)}$

$\int_{-\infty}^{\infty} f(x)\,d(x)\,dx = f(0)$

$\dfrac{\cos(0) - \sin(0)}{\cos(0) + \sin(0)} = 1$ $\quad f(0) * g(0)$

$\cosh(0) = 1$
$\sinh(0) = 1$

$\dfrac{1-0}{1+0} = \boxed{1}$

$\dfrac{\cosh(0) - \sinh(0)}{\cosh(0) + \sinh(0)}$ $\quad \dfrac{1-0}{1+0} = \boxed{1}$

$\boxed{a} + \underbrace{ax + ax^2 \ldots}_{0}$ $\quad \boxed{b} + \underbrace{bx + bx^2 + \ldots}_{0}$

$\dfrac{a + ax + ax^2 - b + bx + bx^2}{a + ax + ax^2 + b + bx + bx^2}$ $\quad \boxed{\dfrac{a-b}{a+b}}$

$\dfrac{a + a(0) + a(0)^2 - b + b(0) + b(0)^2}{a + a(0) + a(0)^2 - b + (b(0)) + b(0)^2} =$