

# PHYS 2210 Fall 2010 Homework Set 1

Due in class on **Aug 26, 2010**  
Show your work!

1. If  $x = \sin(A)$ , write down an expression for  $\cos(2A)$ .
2. Given the two vectors  $\vec{B} = \{2, 2, 1\}$  and  $\vec{C} = \{1, 2, -6\}$ , what is  $\vec{B} \times \vec{C}$ ?
3. Are  $\vec{B}$  and  $\vec{C}$  in the previous problem orthogonal to each other? How can you tell?
4. Given the function  $f(x, y) = xy + z$ , what is the gradient of  $f$ ,  $\nabla f$ ? Is it a vector or scalar?
5. Given the function  $\vec{F} = x\hat{i} + xy\hat{j} + \hat{k}$ , what is the curl of  $\vec{F}$ ,  $\nabla \times \vec{F}$ ? Is it a vector or scalar?
6. Given the function  $\vec{F} = x\hat{i} + xy\hat{j} + \hat{k}$ , what is the divergence of  $\vec{F}$ ,  $\nabla \cdot \vec{F}$ ? Is it a vector or scalar?
7. Given the function  $z = 8x^4 + y^4 - 2xy^2$ , find  $\partial^2 z / \partial x^2$  and  $\partial^2 z / \partial x \partial y$ .
8. Consider a spherical shell that extends from  $r = R$  to  $r = 2R$  with a **non-uniform density**  $\rho(r) = \rho_0 r$ . What is the total mass of the shell?