Preparation Assignment Due 8/31/2000

1. For a vector $\bar{A} = x^2\hat{a}_x + y\hat{a}_y + (5z - y)\hat{a}_z$. Find the divergence $(\nabla \cdot \bar{A})$

2. Is the divergence a measure of the flux of the vector? Is it a measure of the circulation of the vector?

Preparation Assignment Due 9/6/2000

1. Sketch the vector field $F(x, y) = x\hat{a}_x$.

2. A scalar field is given by $V = \frac{Q\cos\theta}{r^2}$ for $r \neq 0$. Find the gradient in the appropriate coordinate system. Find the value of θ at which the r and θ components of the gradient are equal.

Fields and Waves I, HW 1
Due 9/7/2000

1. For a vector $F = x\hat{a}_x - 2y\hat{a}_z$, find the total flux leaving the box with vertices (2,1,0),(2,1,1),(2,0,1),(2,0,0),(0,1,0),(0,1,1),(0,0,0) and (0,0,1) by evaluating $\oint \bar{F} \cdot d\bar{S}$ and then also find the flux by using the divergence theorem.

2. The work done to move a charge from point a to point b is equal to the line integral of the dot product of the force and path length, $\oint F \cdot d\ell$. If the force on a unit charge is given by $F(x, y, z) = 3x\hat{a}_x + 4z\hat{a}_y - 4\hat{a}_z$, how much work is done to move the charge from (0,0,1) to (0,0,-3)?

3. Use rectangular coordinates to show that for any scalar function f, the curl of the gradient is zero ($\nabla \times \nabla f = 0$)