Name .....

Quiz 5
PH361

1. Write the divergence theorem for the vector function $\vec{\mathbf{E}}$.

$$\int \vec{\nabla} \cdot \vec{A}\, d\tau = \oint \vec{A} \cdot d\vec{a}$$

2. Derive the two ordinary differential equations using separation of variables for Laplace's equation in cylindrical coordinates when V does not depend on z. Note $\nabla^2 t = \frac{1}{s}\frac{\partial}{\partial s}(s\frac{\partial t}{\partial s}) + \frac{1}{s^2}\frac{\partial^2 t}{\partial^2 \phi} + \frac{\partial^2 t}{\partial^2 z}$

$V = S(s)\Phi(\phi)$

$$\nabla^2 V = \frac{\Phi(\phi)}{s}\frac{d}{ds}\left(s\frac{dS(s)}{ds}\right) + \frac{S(s)}{s^2}\frac{d^2\Phi(\phi)}{d\phi^2} = 0$$

Divide by $V = S\Phi$ & multiply by s^2

$$\frac{s}{S(s)}\frac{d}{ds}\left(s\frac{dS(s)}{ds}\right) + \frac{1}{\Phi(\phi)}\frac{d^2\Phi(\phi)}{d\phi^2} = 0$$

$$\| \qquad\qquad \| \qquad = 0$$

$$C_1 \quad + \quad C_2$$

$$\frac{s}{S}\frac{d}{ds}\left(s\frac{dS}{ds}\right) = C_1 \qquad \frac{1}{\Phi(\phi)}\frac{d^2\Phi}{d\phi^2} = C_2$$