Name .....

**Quiz 4**
**PH361**

1. Find the general solution to Laplace's equation in cylindrical coordinates, for the case where V depends only on s. Note $\nabla^2 t = \frac{1}{s}\frac{\partial}{\partial s}(s\frac{\partial t}{\partial s}) + \frac{1}{s^2}\frac{\partial^2 t}{\partial^2 \phi} + \frac{\partial^2 t}{\partial^2 z}$

$$\nabla^2 V = \frac{1}{s}\frac{\partial}{\partial s}\left(s\frac{dV}{ds}\right) + \underbrace{\frac{1}{s^2}\frac{\partial^2 V}{\partial \phi^2}}_{=0} + \underbrace{\frac{\partial^2 t}{\partial z^2}}_{=0} = 0$$

If this is to be zero then $s\frac{dV}{ds} = \text{constant}$.

Solving this O.D.E. we have (putting variables on opposite sides of the eqn)

$$dV = \text{constant}\ \frac{ds}{s}$$

$$V = \int dV = \text{constant}\int\frac{ds}{s} = \text{constant}\ \ln(s) + \text{constant}'$$