PH108 : Electricity & Magnetism
Weekly Quiz 1 - Use of Plane Polar Co-ordinates

24 January, 2018

Instructions: Read these before beginning!

1) Fill out the details carefully & correctly, else the quiz will NOT fetch you marks or attendance.

2) You have **5 min** to fill all the answer(s) at the specified location(s), for a total of **1 mark**.

3) There will be NO partial marking. Only answer(s) at specified location(s) will be considered.

4) Any sort of malpractice will be strongly penalised!

All the Best!   Use the backside for rough work.

Question

Let I = $\int\limits_{-\infty}^{\infty} e^{-x^2} dx$. The goal is to find I. (Don't worry, we are here to help.)

Notice that it is a definite integral, making I independent of x.
(x is a dummy variable and can be replaced $\rightarrow$ integration variable)

Consider $I^2 = I * I$. We can write the first I with x and second I with y as integration variable.

Observe something familiar about the double integral, emerging out of the product...
(Use: x and y are INDEPENDENT, use standard r and θ)

Carefully, write out I^2 with correct limits in polar co-ordinates:

$\int \quad \int \qquad\qquad dr\ r\ d\theta$ $\qquad\qquad\qquad$ [$\frac{1}{2}$ **mark**]

Integrate the expression, and find the value of **I** (careful here).
Hint: You may want to substitute for r

I = $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ [$\frac{1}{2}$ **mark**]

————————Question Ends Here————————

P.S.: For more information, read about 'Error Function'.