Abdul-Ahad Butt

Quiz 9

1) Adrien Marie Legendre
"Elements de geométrie" (1794)

2) Victor Poncelet
"Traité des propriétés projectives des figures" (1822)
Contained all the essential concepts underlying the new form of geometry, such as cross ratio, perspectivity, projectivity, involution, and even circular points at infinity.
Also contained theory of polygons inscribed in one conic and circumscribed to another one.

3) Small-town mayor near Paris

4) Everiste Galois

5) $$q = \int_{-\infty}^{\infty} e^{-x^2/2}\,dx \xrightarrow[\text{'x' as placeholder}]{\text{can replace}} q = \int_{-\infty}^{\infty} e^{-y^2/2}\,dy$$

$$q^2 = \left(\int_{-\infty}^{\infty} e^{-x^2/2}\,dx\right)\left(\int_{-\infty}^{\infty} e^{-y^2/2}\,dy\right)$$
$$= \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} e^{-\frac{(x^2+y^2)}{2}}\,dx\,dy$$

Double integral

Using polar coordinates: $dx\,dy \to r\,dr\,d\theta$

$$x^2+y^2 \to r^2$$

$$0 \leq r < \infty \quad 0 \leq \theta < 2\pi$$

$$a^2 = \int_0^{\infty}\int_0^{2\pi} re^{-\frac{r^2}{2}}\, d\theta\, dr$$

$$= \int_0^{\infty} re^{-\frac{r^2}{2}} \left(\int_0^{2\pi} d\theta\right) dr$$

$$= \int_0^{\infty} re^{\frac{-r^2}{2}} (2\pi)\, dr = 2\pi \int_0^{\infty} re^{\frac{-r^2}{2}}\, dr$$

$$\int re^{\frac{-r^2}{2}} = -e^{-r^2/2} + C,$$

$$\int_0^{\infty} re^{\frac{-r^2}{2}}\, d\theta\, dr = -e^{-r^2/2}\Big|_0^{\infty}$$

$$= -e^{-\infty} - -e^{0} = 1$$

So we get $a^2 = 2\pi$

and $a = \sqrt{2\pi}$,