

# Quiz 2

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Let  $A$  be the area bounded by the curves

$$\begin{aligned}y &= e^{x^2} \\y &= 0 \\x &= 0 \\x &= 5\end{aligned}$$

Find the volume when  $A$  is rotated about the  $y$ -axis.

**Solution.** We shall use cylindrical shells. At some  $x$ -value, the shell is a cylinder with radius  $x$  and height  $e^{x^2}$ . So the area of this cylinder is  $2\pi x e^{x^2}$ . Therefore, the volume we seek is

$$\int_0^5 2\pi x e^{x^2} dx$$

Using the substitution  $u = x^2$  we obtain  $du = 2x dx$  so

$$\begin{aligned}\int_0^5 2\pi x e^{x^2} dx &= \int_0^5 \pi e^u du \\&= \pi(e^u)|_0^5 \\&= \pi(e^{x^2})|_0^5 \\&= \pi(e^{25} - e^0) \\&= \pi(e^{25} - 1)\end{aligned}$$

and we're done!