$$\int_{-\pi/4}^{\pi/4} e^{-ix} =$$

$$\frac{-e^{-ix}}{i} \Big]_{-\frac{\pi}{4}}^{+\frac{\pi}{4}} =$$

$$\frac{-ie^{-ix}}{-1} \Big]_{-\frac{\pi}{4}}^{+\frac{\pi}{4}} =$$

$$ie^{-ix} \Big]_{-\frac{\pi}{4}}^{+\frac{\pi}{4}} =$$

Here comes the rabbit out of the hat. Recall Euler's formula (link to https://en.wikipedia.org/wiki/Euler%27s_formula), which says:

$$e^{ix} = \cos(x) + i \times \sin(x)$$

Applying that to the function at hand we have:

$$i\ (\cos(-x) + i \times \sin(-x)\ \ ]_{-\frac{\pi}{4}}^{+\frac{\pi}{4}}\ ) =$$

$$i\ (\cos(-\frac{\pi}{4}) + i \times \sin(-\frac{\pi}{4}) - [\ \cos(-\frac{\pi}{4}) + i \times \sin(-\frac{\pi}{4})\ ]\ ) =$$

$$i\ (\frac{\sqrt{2}}{2} + i \times - \frac{\sqrt{2}}{2} - [\ \frac{\sqrt{2}}{2} + i \times \frac{\sqrt{2}}{2}\ ]\ ) =$$

$$i\ (\frac{\sqrt{2}}{2} + i \times - \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2} - i \times \frac{\sqrt{2}}{2}\ ) =$$

$$i\ (-i \times \frac{\sqrt{2}}{2} - i \times \frac{\sqrt{2}}{2}\ ) =$$

$i\ (-2i \times \frac{\sqrt{2}}{2}) =$

$i(-i \times \sqrt{2})$

$-i^2 \times \sqrt{2}$

$-(-1) \times \sqrt{2} =$

$\sqrt{2}$ =~ apx. 0.707106781186548