

$$\begin{aligned}
P(-a \leq Z \leq a) &= P(Z \leq a) - P(Z < -a) \\
&= P(Z \leq a) - P(Z \leq -a) \\
&\quad \searrow \text{we just proved this} \\
&= P(Z \leq a) - (1 - P(Z \leq a)) \\
&= 2P(Z \leq a) - 1 = 2\Phi(a) - 1
\end{aligned}$$