1.1) Exponential form of complex numbers

Worked example	Your turn
Express in the form $re^{i\theta}$, where $-\pi < \theta \leq \pi$:	Express in the form $re^{i\theta}$, where $-\pi < \theta \leq \pi$:
$3 - 2i$	$2 - 3i$ $\sqrt{13}e^{-0.983i}$
1	-1 $e^{i\pi}$
$-i$	i $e^{\frac{i\pi}{2}}$

Worked example	Your turn
Express in the form $re^{i\theta}$, where $-\pi < \theta \leq \pi$:	Express in the form $re^{i\theta}$, where $-\pi < \theta \leq \pi$:
$\sqrt{2}\left(\cos\frac{\pi}{5} + i\sin\frac{\pi}{5}\right)$	$\sqrt{3}\left(\cos\frac{\pi}{8} + i\sin\frac{\pi}{8}\right)$ $\sqrt{3}e^{\frac{\pi i}{8}}$
$\sqrt{13}(\cos(0.983) + i\sin(0.983))$	$\sqrt{13}(\cos(-0.983) + i\sin(-0.983))$ $\sqrt{13}e^{-0.983i}$
$\cos\pi + i\sin\pi$	$\cos\frac{\pi}{2} + i\sin\frac{\pi}{2}$ $e^{\frac{i\pi}{2}}$

Worked example	Your turn
Express in the form $re^{i\theta}$, where $-\pi < \theta \leq \pi$:	Express in the form $re^{i\theta}$, where $-\pi < \theta \leq \pi$:
$\sqrt{2}\left(\cos\frac{\pi}{5} - i\sin\frac{\pi}{5}\right)$	$\sqrt{5}\left(\cos\frac{\pi}{3} - i\sin\frac{\pi}{3}\right)$
	$\sqrt{5}e^{\frac{-\pi i}{3}}$
$\sqrt{3}\left(\cos\left(-\frac{\pi}{7}\right) - i\sin\left(-\frac{\pi}{7}\right)\right)$	

Worked example	Your turn
Express in the form $x + iy$, where $x, y \in \mathbb{R}$:	Express in the form $x + iy$, where $x, y \in \mathbb{R}$:
$\sqrt{2}e^{\frac{3\pi i}{4}}$	$\sqrt{2}e^{-\frac{3\pi i}{4}}$
	$z = -1 - i$
$e^{-\frac{i\pi}{2}}$	$e^{i(0)}$
	$z = 1$

Worked example	Your turn
Express in the form $r(\cos\theta + i\sin\theta)$, where $-\pi < \theta \le \pi$:	Express in the form $r(\cos\theta + i\sin\theta)$, where $-\pi < \theta \le \pi$:
$$2e^{\frac{23\pi i}{5}}$$	$$4e^{\frac{33\pi i}{7}}$$
	$$4(\cos\frac{5\pi}{7} + i\sin\frac{5\pi}{7})$$
$$3e^{\frac{-25\pi i}{8}}$$	

Worked example	Your turn
Use $e^{i\theta} = \cos\theta + i\sin\theta$ to show that $\cos\theta = \frac{1}{2}(e^{i\theta} + e^{-i\theta})$	Use $e^{i\theta} = \cos\theta + i\sin\theta$ to show that $\sin\theta = \frac{1}{2i}(e^{i\theta} - e^{-i\theta})$

$$e^{i\theta} = \cos\theta + i\sin\theta$$

$$e^{-i\theta} = \cos(-\theta) + i\sin(-\theta)$$

$$= \cos\theta - i\sin\theta$$

$$e^{i\theta} - e^{-i\theta} = 2i\sin\theta$$

$$\sin\theta = \frac{1}{2i}(e^{i\theta} - e^{-i\theta})$$