34. (a) Determine the real and imaginary parts of $\dfrac{(1+\mathrm{j})^2}{\sqrt{2}(1-\mathrm{j})}$

(b) What is the polar form of this complex number?

(a) $$\frac{(1+j)^2}{\sqrt{2}(1-j)} = \frac{1+j+j-1}{\sqrt{2}(1-j)} \cdot \frac{1+j}{1+j}$$

$$= \frac{2j(1+j)}{\sqrt{2}(1+1)}$$

$$= \frac{\cancel{2}j-\cancel{2}}{\cancel{2}\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{\sqrt{2}}{2}j - \frac{\sqrt{2}}{2}$$

$$x = -\frac{\sqrt{2}}{2} \quad ; \quad y = \frac{\sqrt{2}}{2}$$

(b) $$\frac{(1+j)^2}{\sqrt{2}(1-j)} = -\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}j$$

$$= \cos\left(\frac{3\pi}{4}\right) + j\sin\left(\frac{3\pi}{4}\right)$$

$$= e^{j\frac{3\pi}{4}}$$

35. Put $z = -2(\cos 30^\circ - \mathrm{j}\sin 30^\circ)$:

(a) into the form $x + \mathrm{j}y$,

(b) into exponential form.

(a) $$z = -2\left[\cos\left(\frac{\pi}{6}\right) - j\sin\left(\frac{\pi}{6}\right)\right]$$

$$= 2\left[-\cos\left(\frac{\pi}{6}\right) + j\sin\left(\frac{\pi}{6}\right)\right]$$

$$= 2\left(-\frac{\sqrt{3}}{2} + j\,\frac{1}{2}\right)$$

$$= -\sqrt{3} + j$$

(b) $$z = -2\left[\cos\left(\frac{\pi}{6}\right) - j\sin\left(\frac{\pi}{6}\right)\right]$$

$$= 2\left[\cos\left(\frac{5\pi}{6}\right) + j\sin\left(\frac{5\pi}{6}\right)\right]$$

$$= 2e^{j\frac{5\pi}{6}}$$