Question 7 (7 marks)

Consider the complex numbers $z = i$ and $w = \dfrac{\sqrt{2}}{1-i}$.

(a) (i) Express z in exact polar form.

(1 mark)

    (ii) Express w in exact polar form.

(1 mark)

(b) On the Argand diagram in Figure 6, draw and label z, w, and $z + w$.

Figure 6 (2 marks)

(c) (i) Using z, w, and $z+w$ from part (b), show that $\arg(z+w) = \dfrac{3\pi}{8}$.

(1 mark)

(ii) Write $z+w$ in Cartesian form.

(1 mark)

(iii) Hence show that $\tan\dfrac{3\pi}{8} = 1+\sqrt{2}$.

(1 mark)