

# Solutions: Problem Set A

1) See posted Python scripts

2) — 11 —

3)  $x^3 + 8 = 0$

$$(x+2)(x^2-2x+4) = 0$$

$x = -2$  or  $x^2 - 2x + 4 = 0$

$$x^2 - 2x + 1 = -3$$

$$(x-1)^2 = -3$$

$$x-1 = \pm\sqrt{-3} = \pm\sqrt{3}i$$

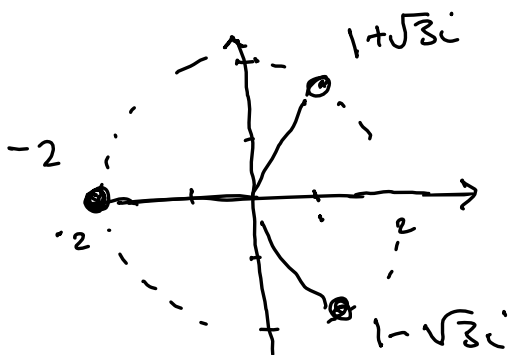
$x = 1 \pm \sqrt{3}i$

Find one root:

$$x^3 = -8$$

$$x = \sqrt[3]{-8} = -2$$

Solutions:  $x_1 = -2$   $x_2 = 1 + \sqrt{3}i$   $x_3 = 1 - \sqrt{3}i$



4)

$$\begin{vmatrix} i & 1 & 1 \\ 1 & i & 1 \\ 1 & 1 & i \end{vmatrix}$$

$$= i \begin{vmatrix} 1 & 1 \\ 1 & i \end{vmatrix} - 1 \begin{vmatrix} i & 1 \\ 1 & i \end{vmatrix} + 1 \begin{vmatrix} i & i \\ 1 & 1 \end{vmatrix}$$

$$= i(i^2 - 1) - (i - 1) + (1 - i)$$

$$= i(-1 - 1) - i + 1 + 1 - i$$

$$= \underline{2 - 4i} \neq 0$$

$$\downarrow$$

$$\text{rk} \begin{pmatrix} i & 1 & 1 \\ 1 & i & 1 \\ 1 & 1 & i \end{pmatrix} = 3$$