1.   True or False?

For how many values of x is the following matrix singular?

$$\begin{pmatrix} 2 - x & 4 \\ 8 & 8 - x \end{pmatrix}$$

(A) 0
(B) 1
(C) 2
(D) Infinitely many

2. Let A_θ be the matrix representing the linear map $h_\theta : \mathbb{R}^2 \to \mathbb{R}^2$ that rotates vectors counterclockwise by an angle θ. For how many values of θ is A_θ singular?

(A) 0

(B) 1

(C) 2

(D) Infinitely many

3. What is the area of the parallelogram formed by the following vectors?

$$\langle \begin{pmatrix} 1 \\ 3 \end{pmatrix}, \begin{pmatrix} -1 \\ 4 \end{pmatrix} \rangle$$

(A) 1
(B) 3
(C) 4
(D) 7

4.   True or False?

Let $h : \mathbb{R}^3 \to \mathcal{P}_2$ be the linear map whose representation
matrix with respect to the standard basis on $\mathbb{R}^3$ and the basis
$\langle 1, 1 + x^2, x \rangle$ on $\mathcal{P}_2$ is the following matrix.

$$\begin{pmatrix} 1 & 3 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 1 \end{pmatrix}$$

Then $1 + 2x$ is in $\mathscr{R}(h)$.

5.   True or False?

The only 2×2 matrices A such that $A^2 = I$ are the following:

$$\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \quad \begin{pmatrix} -1 & 0 \\ 0 & -1 \end{pmatrix}$$