

1. Find all p and q for which the following system has infinitely many solutions.

$$2x - y = 3$$

$$x + py = q$$

- A. $p = 2, q = -3/2.$
B. $p = -1/2, q = -3.$
C. $p = 1/2, q = 3.$
D. $p = 1/2, q = -3.$
E. $p = -2, q = 3/2.$
F. $p = -1/2, q = 3/2.$
2. The volume of a parallelepiped generated by $(1, 1, 0)$, $(1, 0, -1)$ and $(1, 1, 1)$ is:

- A. $\sqrt{3}$
B. 3
C. 2
D. -2
E. -1
F. 1

3. $S = \{A \in M_{22}(\mathbb{R}) \mid A = A^t\}$ is the subspace of symmetric 2 by 2 matrices. The dimension of S is:

- A. 5
- B. 2
- C. 4
- D. 3
- E. 0
- F. 1

4. Find the eigenvalues of $\begin{pmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{pmatrix}$.

- A. -1, 0, 1
- B. 1, 2
- C. -1, 0
- D. 1, 2, 3
- E. 1, 3
- F. 2, 3

5. Compute $\begin{pmatrix} -1 & -3 & 1000001 \\ 0 & 1 & \end{pmatrix}$
- A. $\begin{pmatrix} -1000001 & -3000003 \\ 0 & 1000001 \end{pmatrix}$
- B. $\begin{pmatrix} -1 & 3^{1000001} \\ 0 & 1 \end{pmatrix}$
- C. $\begin{pmatrix} -1 & -3 \\ 0 & 1 \end{pmatrix}$
- D. $\begin{pmatrix} 1000001 & -3000003 \\ 0 & -1000001 \end{pmatrix}$
- E. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
- F. $\begin{pmatrix} 1 & -3 \\ 0 & -1 \end{pmatrix}$

6. B is a 4×4 matrix with $\det(2BB^t) = 64$. Find $\det(3B^2B^t)$.
- A. 192
- B. 256
- C. 324
- D. 648
- E. 128
- F. 640