1. For any vector $\bar{\mathbf{x}}$, a positive-definite matrix satisfies the property $\bar{\mathbf{x}}^T\mathbf{A}\bar{\mathbf{x}} > 0$
   Ans c
2. Convex combination of points $\bar{\mathbf{x}}_1$, $\bar{\mathbf{x}}_2$ is $\theta_1\bar{\mathbf{x}}_1 + \theta_2\bar{\mathbf{x}}_2$, for all non-negative values θ_1, θ_2 with $\theta_1 + \theta_2 = 1$
   Ans a
3. Affine combination of points $\bar{\mathbf{x}}_1$, $\bar{\mathbf{x}}_2$ is $\theta\bar{\mathbf{x}}_1 + (1-\theta)\bar{\mathbf{x}}_2$, for all values of θ.
   Ans c
4. Matrix inversion identity states that $(\mathbf{A} + \mathbf{UCV})^{-1}$ equals $\mathbf{A}^{-1} - \mathbf{A}^{-1}\mathbf{U}(\mathbf{C}^{-1} + \mathbf{V}\mathbf{A}^{-1}\mathbf{U})^{-1}\mathbf{V}\mathbf{A}^{-1}$
   Ans b
5. The eigenvalues λ of a matrix $\mathbf{A}$ are given by the equation $|\mathbf{A} - \lambda\mathbf{I}| = 0$
   Ans d
6. As shown in lectures, the quantity $(\mathbf{I} + \bar{\mathbf{x}}\bar{\mathbf{x}}^T)^{-1}$ is given as
$$\mathbf{I} - \frac{\bar{\mathbf{x}}\bar{\mathbf{x}}^T}{1 + ||\bar{\mathbf{x}}||^2}$$
   Ans a
7. Given a vector $\bar{\mathbf{x}}$, its l_1 , l_2 and l_∞ norms satisfy the property
$$||\bar{\mathbf{x}}||_1 \geq ||\bar{\mathbf{x}}||_2 \geq ||\bar{\mathbf{x}}||_\infty$$
   Ans b
8. The l_∞ norm of a vector $\bar{\mathbf{x}}$, denoted by $||\bar{\mathbf{x}}||_\infty$, is defined as
$$\max\{|x_1|, |x_2|, \ldots, |x_n|\}$$
   Ans c
9. Given the matrix $\begin{bmatrix} 1 & 1 & -1 & -1 \\ 1 & -1 & 1 & -1 \end{bmatrix}$. A basis for its null space is $u_1 = [1 \quad 1 \quad 1 \quad 1]^T, u_2 = [1 \quad -1 \quad -1 \quad 1]^T$ since both vectors give 0 when multiplied with the matrix and are orthogonal to each other. Hence, they are linearly independent
   Ans c
10. Given the matrix $\mathbf{X} = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$. The row echelon form is evaluated as follows
$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix} \longrightarrow \begin{bmatrix} 1 & 1 & 1 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$$
    As can be seen, its rank is 3
    Ans d