Relations and Functions

1. Let f:R→R be defined by f(x)=2x+3f(x)=2x+3f(x)=2x+3. Find its inverse.
2. Determine if f(x)=x^2 defined on R is one-to-one.
3. Show that the composition of two bijections is a bijection.
4. Check whether the relation RRR on {1,2,3} is defined by pairs (1,2), (2,3), (3,1) is transitive.
5. If f(x)= e^x, find f^{-1}(y) and its domain.

Inverse Trigonometric Functions

1. Simplify sin^-1(0.6) + cos^-1(0.6).
2. Find the principal value of tan^-1(root(3)).
3. Solve sin^-1(x) + sin^-1(y) =pi/2.
4. Evaluate tan^-1(1/2) + tan^-1(2).
5. If theta = cos^-1(x), express sin(theta/2).

Matrices

1. If A = [[1, 2],[3, 4]], find A^2 - 5A + 7I
2. Show that the product of two symmetric matrices is symmetric if and only if they commute.
3. Show that I (identity matrix) is the multiplicative identity for matrix multiplication.
4. If A is a skew-symmetric matrix, show that A^T = -A.
5. Determine whether the matrix [[0,1],[-1,0]] is orthogonal.

Determinants

1. Solve the system:
   2x+3y+z = 5, 4x+y+2z = 6, 3x+2y+4z = 7 using Cramer's Rule.
2. Show that the determinant is zero if two rows are identical.
3. If A is a singular matrix, show that |A|=0.
4. Find the value of k if the system x+2y+3z=1, 2x+3y+4z=2, 3x+4y+kz=3 has infinitely many solutions.
5. Prove that |AB|= |A||B| for square matrices A,B.