

Trinity Western University
Department of Mathematical Sciences
MATH250 (Linear Algebra)
Sample Mid-Term II Examination

1. Let A and B be the end points of a diameter of a circle. If C is any other point on the circle, show that AC and BC are perpendicular.
2. Find the equation of the line passing through $P_0(1, 1, 2)$ intersecting the line $L: (x, y, z) = (2, 1, 0) + t(1, 1, 1)$, and perpendicular to that line.
3. For what value(s) of k and (w_1, w_2, w_3) the range of the linear operator defined by the equations
$$\begin{aligned}w_1 &= x_1 + 2x_2 + x_3 \\w_2 &= -2x_1 + x_2 + 4x_3 \\w_3 &= 7x_1 + 4x_2 + kx_3\end{aligned}$$
is not in \mathbb{R}^3 ?
Also for any value of k , find which vectors (x_1, x_2, x_3) map into the line $w_1 = 1+2t$, $w_2 = 1+t$, $w_3 = 1+4t$.
4. If V is a set of ordered pairs (x, y) of real numbers with the following operations.
 $(x, y) + (x', y') = (x + x', y + y' + 1)$ and $k(x, y) = (kx, ky + k - 1)$,
determine if it is a vector space. If it is not, list all axioms that fail to hold.
5. Is the set V of all 2×2 matrices with equal column sums a subspace of M_{22} ? If not, why not?