• Complete all questions.
• You may use a scientific, non-graphing calculator during this examination. Other electronic devices are not allowed, and should be turned off for the duration of the exam.
• If you use a trial-and-error or guess-and-check method when an algebraic method is available, you will not receive full credit.
• You may use one hand-written 8.5 by 11 inch page of notes.
• Show all work for full credit.
• You have 50 minutes to complete the exam.
1. Find the angle between the vectors \( \langle 3, 4, -1 \rangle \) and \( \langle 5, 2, 8 \rangle \).
2. Find the plane containing the line

\[ x = 3 - t, \ y = 2 - \frac{1}{2}t, \ z = 6 + 2t \]

and the point \((4, -5, 2)\).
3. Where does the plane

\[ 3x - y + 5z = 12 \]

intersect the line

\[ x = 5t + 1, \ y = 4t + 2, \ z = 5t - 1? \]
4. Find the arc length of the curve

\[ x = t^2, \quad y = \frac{2}{3} t^3 \]

for \(0 \leq t \leq 5\).
5. Let \( C \) be the polar curve
\[ r = \theta^2. \]

(a) \( C \) intersects the line \( y = x \) infinitely many times. Give the Cartesian coordinates of one point of intersection which is not the origin.

(b) Find the slope of the tangent line to \( C \) at the point you gave in (a).