

Exam 1, Mathematics 20C

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Name:

Student ID:

Section Number:

Note: There are 3 problems on this exam. You will not receive credit unless you show all your work. No books, calculators, notes or tables are permitted.

I. (30 points)

- (1) Sketch the curve with polar equation $r = \sin \theta$.
- (2) Write the equation of the tangent line to the curve in (1) at the point corresponding to $\theta = \frac{\pi}{6}$.
- (3) Find the points on the curve above where the tangent to the curve is horizontal.
- (4) Find a cartesian equation for the curve in (1) and identify the curve.

II. (40 points) Let $\vec{a} = \langle 1, 0, 1 \rangle$ and $\vec{b} = \langle 1, 1, 0 \rangle$.

- (1) Compute the angle $\theta \in [0, \pi)$ determined by the vectors \vec{a} and \vec{b} .
- (2) Find a unit vector \vec{u} which makes an angle of $\pi/3$ radians with both \vec{a} and \vec{b} .
- (3) Find the area of the parallelogram determined by the vectors \vec{a} and \vec{b} .
- (4) Write the equation of the plane passing through $P_0(0, 0, 0)$ and which is perpendicular on \vec{a} .

III. (40 points) Let $(\pi_1) : x - z - 2 = 0$ and $(\pi_2) : x - y = 0$ be the equations of two planes (π_1) and (π_2) .

- (1) Find the angle $\theta \in [0, \pi)$ determined by the two planes above.
- (2) Find the symmetric equations of the line of intersection between the two planes above.
- (3) Find the distance between the point $P_0(2, 0, 1)$ and the plane (π_1) .
- (4) Find the point of intersection between the plane (π_1) and the line which passes through $P_0(2, 0, 1)$ and is perpendicular on (π_1) .