

Name: _____

Section: _____

- No calculator, please.
- Explain the method used.

- (1) Find the equation of the tangent line to the curve $r = \sin 3\theta$ at the point specified by $\theta = \frac{\pi}{6}$

- (2) Find the length of the polar curve $r = 3 \cos \theta$ for $0 \leq \theta \leq \frac{\pi}{4}$ and sketch the graph of the curve.

- (3) Find an equation of a sphere if one of its diameters has end-points $(2, 1, 4)$ and $(4, 3, 10)$.

- (4) Given $P = (2, 1, 3)$, $Q = (1, -1, 0)$, $R = (1, 1, -1)$, $S = (0, 1, -2)$ determine whether the vectors \overrightarrow{PQ} and \overrightarrow{RS}
 - (a) are parallel
 - (b) are perpendicularby using the cross and dot products.

- (5) Find the area of the triangle with vertices

$$P = (1, -1, 0) \quad Q = (2, 1, -1) \quad R = (3, 2, 1)$$