

CALCULUS III: HW 1

Due Tuesday, September 14 by 11pm on Gradescope.

QUESTION 1

- (a). Find an equation in polar coordinates for the circle with center $(0, 0)$ and radius 5.
- (b). Find an equation in spherical coordinates for the sphere of radius 3 with center $(0, 0, 0)$.

QUESTION 2

- (a). Write the point $(x, y, z) = (-1, \sqrt{3}, 2)$ in cylindrical coordinates.
- (b). Write the point $(x, y, z) = (-\sqrt{2}, \sqrt{2}, 2\sqrt{3})$ in spherical coordinates.

QUESTION 3

- (a). Find an equation in rectangular coordinates for the plane whose equation in cylindrical coordinates is $\tan(\theta) = 1/2$.
- (b). Find an equation in cylindrical coordinates for the surface whose equation in rectangular coordinates is $z = -x^2 - y^2$.

QUESTION 4

Let $P = (1, 2, -3)$, $Q = (1, -2, 0)$, and $R = (0, -2, -6)$. Find the lengths of the sides of the triangle PQR . Is it an isosceles triangle? Is it a right triangle? Justify your answers.

QUESTION 5

Find an equation (in rectangular coordinates) for the sphere consisting of points whose distance to $(-4, -4, -4)$ is twice their distance to $(2, 2, 2)$. (For example, $(0, 0, 0)$ is such a point.) What are the center and radius of this sphere?

QUESTION 6

Does the sphere $x^2 + y^2 + (z - 3)^2 = 1$ intersect the plane $z - x = 3$? If so, find a point in their intersection. If not, explain why.