MA 126 (Calculus-II) Midterm test #3
Show your work. Fri, Dec 2

1. (10 pts) Find the distance from the point $P(3, -1, 0)$ to the plane $2x + 4y - 4z = 14$.

2. (15 pts) Two planes are given: $2x - y - 4z = 5$ and $x = 2z + 1$.
(a) Find parametric equations and symmetric equations for these line of intersection of the planes.
(b) Determine the angle between these planes.

3. (10 pts) Find the volume of the parallelepiped with adjacent edges PQ, PR, and PS, where $P(2, -1, 1)$, $Q(6, 0, 4)$, $R(3, 2, 0)$, $S(0, 3, 5)$.

4. (15 pts) Write its first four nonzero terms of the Maclaurin series for the function $y = \sqrt[3]{1 - x^2}$.

5. (10 pts) (a) Find a vector perpendicular to the plane through the points $P(1, 0, -2)$, $Q(0, 3, 5)$ and $R(-1, 2, 2)$.
(b) Find the area of the triangle PQR.

6. (15 pts) Find the Taylor series for the function $y = \cos x$ centered at $a = \pi$. Write a general formula for the series and also write down its first three terms.

7. (10 pts) Show that the equation

$$2x^2 + 2y^2 + 2z^2 + 12x - 4y + 8z + 10 = 0$$

represents a sphere. Find its center and radius.

8. (15 pts) Recall Maclaurin series for e^x and $\ln(1 + x)$. Then use multiplication to find first three nonzero terms for the Maclaurin series of the function $y = e^{-x} \ln(1 + 2x)$.

[Bonus] Find the distance between two skew lines

$$\frac{x + 5}{0} = \frac{y - 4}{2} = \frac{z + 1}{-3}$$

and

$$\frac{x - 3}{2} = \frac{y}{6} = \frac{z - 2}{0}$$