

Math 241, Spring 2007, Merit Practice Exam 1

Usual warnings apply. I am not writing the exam and I have not seen the exam.

1. What are the symmetric equations of the line perpendicular to the plane $2x + 4z = 6$ that goes through the point $(6, 2, 1)$?
2. Consider the curve with position vector $r(t) = 4t\vec{i} + 2/3 t^3\vec{j} - 2t^2\vec{k}$.
Find the arc length of the curve traced out by $\vec{r}(t)$ from the point $P(0, 0, 0)$ to $Q(4, 2/3, -2)$.
3. Consider the lines:

$$\begin{aligned}L_1 : \quad x &= t + 1, \quad y = 3t - 1, \quad z = 15t - 12 \\L_2 : \quad x &= 2 - s, \quad y = 1 - 2s, \quad z = -1 - 11s\end{aligned}$$

Are these lines parallel or skew or do they intersect? If they intersect, where do they intersect?

4. Consider a moving particle with position vector

$$\vec{r}(t) = \langle t, 2t - 1, 3t^2 + 5 \rangle$$

at time t .

Find the tangential and normal components of the acceleration at time t .

5. What is the area of the triangle determined by the three points $(1, 2, 3)$, $(4, 5, 6)$ and $(7, 8, 9)$?
6. Find the curvature of the plane curve $y = x^3$ at the point $(2, 8)$.
7. What are the traces of the surface given by the equation $x^2 - y^2 + z^2 = 1$?
8. Convert from cylindrical coordinates to cartesian coordinates: $(3, \pi/3, 7)$.

Best of luck on Monday!