

Math 2313, Test I

Name _____

1. Find the equations (parametric or symmetric) of the line:
 - a. perpendicular to the plane $2x - 3y + 4z - 5 = 0$ and through the point $(2, 1, 1)$.
answer: $x = 2 + 2t, y = 1 - 3t, z = 1 + 4t$ or $\frac{x-2}{2} = \frac{y-1}{-3} = \frac{z-1}{4}$
 - b. through the points $(0, 1, 0), (2, 0, 3)$.
answer: $(2, 0, 3) - (0, 1, 0) = \langle 2, -1, 3 \rangle$ so $x = 2t, y = 1 - t, z = 3t$
(many other forms possible)

2. Consider the two lines $x = 1 + 4t, y = -3t, z = -1 + 2t$ and $x = 5 + t, y = -3 + 5t, z = 1 - t$.
 - a. Find a vector perpendicular to both lines.
answer: $(-7, 6, 23)$
 - b. The lines intersect at $(5, -3, 1)$; find the angle of intersection.
answer: $\theta = 117.68$ (or 62.32) degrees

3. Find the volume of a parallelepiped which has edges $u = \langle 1, 3, 1 \rangle$ and $v = \langle 3, 5, 2 \rangle$ and $w = \langle 0, 0, 1 \rangle$.

answer: 4

4. If $r(t) = \langle \sin(\pi t^3), \cos(\pi t^3), t^3 \rangle$, find the velocity $r'(t)$ and the speed, $\|r'(t)\|$.

answer: $r'(t) = \langle 3t^2\pi\cos(\pi t^3), -3t^2\pi\sin(\pi t^3), 3t^2 \rangle$, $\|r'(t)\| = 3t^2\sqrt{\pi^2 + 1}$

5. Find the length of the helix of problem 4, from $t = 0$ to $t = 1$.

answer: $\int_0^1 \|r'(t)\| dt = \int_0^1 3t^2\sqrt{\pi^2 + 1} dt = \sqrt{\pi^2 + 1}$

6. Find parametric equations for the tangent line to the helix of problem 4, at the point $(0, -1, 1)$.

answer: $x = -3\pi t, y = -1, z = 1 + 3t$