

Math 2313, Test I

Name _____

1. Find the equation of the plane:
 - a. perpendicular to the line $x(t) = t, y(t) = -2t, z(t) = -5t$ and through the point $(1, -1, 3)$.
answer: $1(x - 1) - 2(y + 1) - 5(z - 3) = 0$, or $x - 2y - 5z + 12 = 0$

 - b. through the points $(0, 0, 0), (-2, 1, 1), (0, 2, 1)$.
answer: $\langle -2, 1, 1 \rangle \times \langle 0, 2, 1 \rangle = \langle -1, 2, -4 \rangle$, so
 $-x + 2y - 4z = 0$

2. Consider the two planes $x + y - z = 0$ and $x + 2y + z = 5$.
 - a. Find parametric equations for the line of intersection of these planes. (Hint: set $z = t$ and solve for $x(t), y(t)$.)
answer: $x = 3t - 5, y = 5 - 2t, z = t$

 - b. Find the angle between the two planes (at the intersection).
answer: 61.9° or 118.1° .

3. a. Convert the equation $\rho = 2 \cos(\phi)$ to rectangular coordinates. What type of surface is this? (Hint: $x = \rho \sin(\phi)\cos(\theta)$, $y = \rho \sin(\phi)\sin(\theta)$, $z = \rho \cos(\phi)$)
 answer: $x^2 + y^2 + z^2 = 2z$, a sphere.
- b. Find the cylindrical coordinates for $(-2, 2, 2)$.
 answer: $r = \sqrt{8}$, $\theta = 135^\circ$, $z = 2$
4. If $r(t) = \langle \sin(t^3/3), \cos(t^3/3), t^3 \rangle$,
- a. Find $r'(t)$ and $\|r'(t)\|$.
 answer: $r'(t) = \langle t^2 \cos(t^3/3), -t^2 \sin(t^3/3), 3t^2 \rangle$, $\|r'(t)\| = \sqrt{10}t^2$.
- b. Find the length of this curve from $t = 0$ to $t = 3$.
 answer: $9\sqrt{10}$
5. If $r''(t) = \langle 0, -16 \rangle$, $r(1) = \langle 0, 10 \rangle$ and $r'(1) = \langle -5, 0 \rangle$ find $r(t)$.
 answer: $r(t) = \langle 5 - 5t, 2 + 16t - 8t^2 \rangle$