MATH 2210 HOMEWORK WORKSHEET 3

Name: ________________________

Vector Functions and Space Curves

1. Let $\mathbf{r}(t) = \left\langle \sqrt{2-t}, \quad \dfrac{\mathrm{e}^t - 1}{t}, \quad \ln(1+t) \right\rangle$.

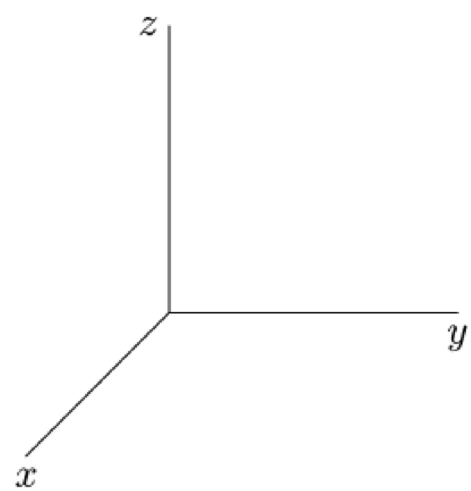
(a) Find the domain of $\mathbf{r}$.

(b) Find $\lim_{t\to 0} \mathbf{r}(t)$.

2. Sketch the curve with the vector equation

$$\mathbf{r}(t) = \langle \sin(\pi t), t, \cos(\pi t) \rangle$$

and indicate with an arrow the direction in which t increases.



3. Find a vector function that represents the curve of intersection of the cylinder $x^2+y^2 = 16$ and the plane $x + z = 5$.

Derivatives and Integrals of Vector Functions

4. Let $\mathbf{r}(t) = \left\langle \sqrt{2-t}, \quad \dfrac{\mathrm{e}^t - 1}{t}, \quad \ln(1+t) \right\rangle$. Find $\mathbf{r}'(t)$.

5. Consider the curve given by $\mathbf{r}(t) = \langle \sin^3 t,\ \cos^3 t,\ \sin^2 t \rangle$, $0 \le t \le \pi/2$. Find the unit tangent vector.

6. Find parametric equations for the tangent line to the curve

$$x = t^2 + 1, \qquad y = 4\sqrt{t}, \qquad z = \mathrm{e}^{t^2 - t}$$

at the point $(2, 4, 1)$.

7. Evaluate the integral

$$\int_0^{\pi/4} \left(\sec t \tan t \,\mathbf{i} + t\cos(2t)\,\mathbf{j} + \sin^2(2t)\cos(2t)\,\mathbf{k}\right)\, dt.$$