

MATH 2210 HOMEWORK WORKSHEET 4

Name: _____

Arc Length and Curvature

1. Find the length of the curve $\mathbf{r}(t) = \langle 2t^{2/3}, \cos(2t), \sin(2t) \rangle$, $0 \leq t \leq 1$.

2. Reparameterize the curve

$$\mathbf{r}(t) = e^t \mathbf{i} + e^t \sin t \mathbf{j} + e^t \cos t \mathbf{k}$$

with respect to arc length measured from the point $(1, 0, 1)$ in the direction of increasing t .

3. Consider the curve given by $\mathbf{r}(t) = \langle \sin^3 t, \cos^3 t, \sin^2 t \rangle$, $0 \leq t \leq \pi/2$.

(a) Find the unit tangent vector. *Note: This question was asked on the previous homework as well.*

(b) Find the unit normal vector.

(c) Find the unit binormal vector.

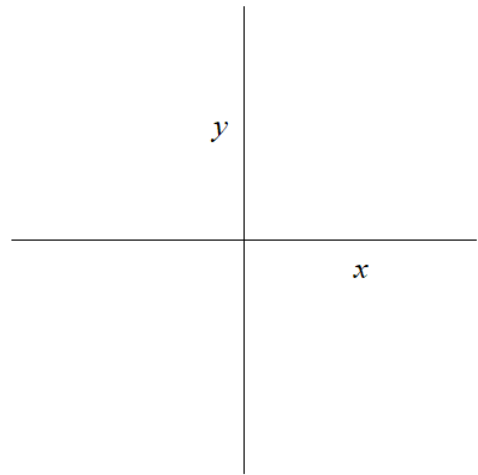
(d) Find the curvature.

Motion in Space: Velocity and Acceleration

4. Find the velocity, speed, and acceleration of a particle moving with position function

$$\mathbf{r}(t) = (2t^2 - 3)\mathbf{i} + 2t\mathbf{j}.$$

Sketch the path of the particle on the axes below and draw the position, velocity, and acceleration vectors for $t = 1$.



5. Find the tangential and normal components of the acceleration vector of the curve

$$\mathbf{r}(t) = t \mathbf{i} + 2e^t \mathbf{j} + e^{2t} \mathbf{k}.$$