

## Week 3 Worksheet

### 1. MATLAB Review

### 2. Integration of Vector-valued Functions

Integrate the following vector-valued functions

(a)

$$\int_0^1 \left[ \frac{1}{\sqrt{1-t^2}} \vec{i} + \frac{\sqrt{3}}{1+t^2} \vec{k} \right] dt$$

(b)

$$\int_0^{\pi/3} \left[ (\sec t \tan t) \vec{i} + \tan t \vec{j} + 2 \sin t \cos t \vec{k} \right] dt$$

### 3. Arc Length

Find the arc length of the following vector-valued functions over the given intervals.

(a)  $r(t) = (6 \sin 2t) \vec{i} + (6 \cos 2t) \vec{j} + 5t \vec{k}, 0 \leq t \leq \pi$

(b)  $r(t) = (2+t) \vec{i} - (t+1) \vec{j} + t \vec{k}, 0 \leq t \leq 3$

(c)  $r(t) = 6t^3 \vec{i} - 2t^3 \vec{j} - 3t^3 \vec{k}, 1 \leq t \leq 2$

### 4. “Special Unit Vectors”

Find  $T$ ,  $N$ ,  $\kappa$ ,  $B$ , and  $\tau$  for

(a)  $r(t) = t \vec{i} + (t^2 + 1) \vec{j}, -2 \leq t \leq 2$

(b)  $r(t) = (\ln \sec t) \vec{i} + t \vec{j}, -\pi/2 < t < \pi/2$