Math 2211: Recitation 5 (T)

Naufil Sakran

(1) Solve any **two** the following problems:

(a) Compute

$$\int \left(4t^{\frac{3}{2}}\ \vec{i} + (t+7)\sqrt{t}\ \vec{k}\right) dt$$

(b) Find the length of the curve

$$\mathbf{r}(t) = \left\langle 4t, t^2, \frac{1}{6}t^3 \right\rangle, \quad 0 \le t \le 1.$$

(c) Find the unit tangent and unit normal vectors $\mathbf{T}(t)$ and $\mathbf{N}(t)$ of the following vector function

$$\mathbf{r}(t) = 3\,\sin(t)\,\mathbf{i} + 3\,\cos(t)\,\mathbf{j}.$$

(2) Solve the following problems. **(Do any two of them)**.

(a) Let C be the curve of intersection of the parabolic cylinder $x^2 = 2y$, and the surface $3z = xy$. Find the length of C from the origin to the point $(2, 2, \frac{4}{3})$.

(b) Find the curvature of the below curve at any general point

$$\mathbf{r}(t) = \langle t, t^2, t^3 \rangle.$$

(c) Find the unit normal and binormal vectors for the circular helix

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

(Bonus) Solve the following integrals. **(Do any one of them)**.

(a) Show that the curvature of a circle of radius a is $\frac{1}{a}$.

(b) Use the formula $\kappa(x) = \frac{|f''(x)|}{[1+(f(x))^2]^{3/2}}$ to find the curvature of $y = 2x^4$.