Problems. March 12.

1. Find the length of the curve

$$\mathbf{r}(t) = 2t\ \mathbf{i} + t^2\ \mathbf{j} + \frac{1}{3}t^3\ \mathbf{k}, \qquad 0 \le t \le 1.$$

2. Reparametrize the curve with respect to arc length measured from the point where $t = 0$ in the direction of increasing t.

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

3. Find $\mathbf{T}$ and κ for the curve

$$\mathbf{r}(t) = t^2\ \mathbf{i} + (\sin t - t\cos t)\ \mathbf{j} + (\cos t + t\sin t)\ \mathbf{k}, \qquad t > 0.$$