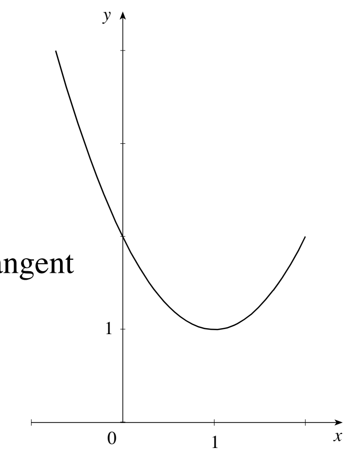
# Math 213 Calculus III

**Reading the Text**

Read Sections 10.3-10.5 and answer the following questions

1. Why do we need to assume that the curve $C$ is traversed exactly once as $t$ increases by the vector function $\mathbf{r} = \mathbf{r}(t)$ in order to define the arc-length function $s = s(t)$,

2. For the following curve, sketch in an approximation of the osculating circle at the point $\langle 1,1 \rangle$




3. What is the relationship between the velocity vector and the tangent vector?

4. A particle moves along the curve defined by the equation $y = \sin(\pi x)$. The $x$ coordinate $x(t)$ of the particle satisfies the equation $\frac{dx}{dt} = e^{2t}$. At $t = 0$, the curve is at the point $\left(\frac{1}{2},1\right)$.

   (a) Find $x(t)$ in terms of $t$.

   (b) Find $y(t)$ in terms of $t$.

   (c) Find the velocity vector $v(t)$.

5. Why parametrize a surface?

## Math 213 Class 04: Projections

Consider the curve given by $\mathbf{r}(t) = t\,\mathbf{i} - \frac{\sqrt{3}}{2}t^2\,\mathbf{j} + \frac{1}{2}t^2\,\mathbf{k}$

Sketch all three planar projections. Can you visualize the entire curve by looking at the projections?

Consider the curve described by $\mathbf{r}(t) = \langle t\cos t, t\sin t, t \rangle$

Sketch all three planar projections. Can you visualize the entire curve by looking at the projections?