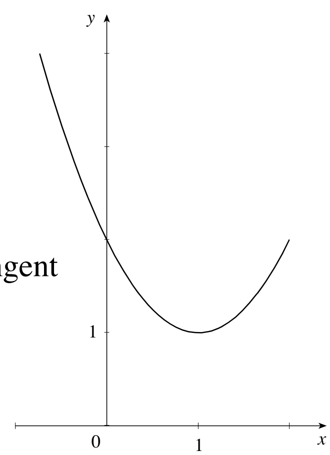
Math 213 Calculus III

Spring 2011
Monday, May 6, 2013
Sections 9.7, 10.1-10.2
Topics:

1. Cylindrical and Spherical Coordinates
2. Connection between space curves and ranges of vector functions
3. Matching vector equations with their curves
4. Parametrization of curves in space are not unique
5. Visualization of curves in 3D
6. The vector derivative and the unit tangent vector
7. The definition of the tangent line to a space curve
8. The geometric interpretation of the tangent vector and smooth curves
9. Integrals of vector functions

Homework for Tuesday
Homework Problems: WebAssign Assignment 4
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 $\dfrac{dx}{dt} = e^{2t}$. At $t = 0$, the curve is at the point $\left(\dfrac{1}{2}, 1\right)$.

   (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?

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?