Math 60, Section
HW #4
Due 9/16, 2016

3.1: 3, 10, 16, 26; 3.2: 4, 14

3.1.3 Sketch the images of the following path, using arrows to indicate the direction in which the parameter increases.

$$\begin{cases} x &= t\cos t \\ y &= t\sin t, \end{cases} \qquad -6\pi \le t \le 6\pi$$

■

3.1.10 Calculate the velocity, speed, and acceleration of the path

$$\mathbf{x}(t) = \left(e^t, e^{2t}, 2e^t\right)$$

■

3.1.16 Find an equation for the line tangent to the given path at the indicated value for the parameter.

$$\mathbf{x}(t) = 4\cos(t)\hat{\mathbf{i}} - 3\sin(t)\hat{\mathbf{j}} + 5t\hat{\mathbf{k}}, t = \pi/3$$

■

3.1.26 Two billiard balls are moving on a (coordinatized) pool table according to the respective paths $\mathbf{x}(t) = \left(t^2 - 2, \frac{t^2}{2} - 1\right)$ and $\mathbf{y}(t) = \left(t, 5 - t^2\right)$, where t represents time measured in seconds.

(a) When and where do the balls collide?

(b) What is the angle formed by the paths of the balls at the collision point?

■

3.2.4 Calculate the length of the path

$$\mathbf{x}(t) = 7\hat{\mathbf{i}} + t\hat{\mathbf{j}} + t^2\hat{\mathbf{k}}, 1 \leq t \leq 3.$$

■

3.2.14 Consider the path $\mathbf{x}(t) = \left(e^{-t}\cos t, e^{-t}\sin t\right)$.

(a) Argue that the path spirals toward the origin as $t \to +\infty$.

(b) Show that, for any a, the improper integral

$$\int_a^\infty |\mathbf{x}'(t)|dt$$

converges.

(c) Interpret what the result in part (b) says about the path $\mathbf{x}$.

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