MA 213 Worksheet #7

Sections 13.1 and 13.2
9/13/18

1 *13.1.7* Sketch the curve $\mathbf{r}(t) = \langle \sin t, t \rangle$. Indicate with an arrow the direction in which t increases.

2 *13.1.17* Find a vector equation and parametric equations for the line segment that joins $P(2, 0, 0)$ to $Q(6, 2, -2)$.

3 *13.1.49* Suppose the trajectories of two particles are given by the vector functions

$$\mathbf{r}_1(t) = \langle t^2, 7t - 12, t^2 \rangle \qquad \mathbf{r}_2(t) = \langle 4t - 3, t^2, 5t - 6 \rangle$$

for $t \geq 0$. Do the particles collide?

4 *13.2.9, 11* Find the derivative of the following vector functions:

(a) $r(t) = \langle \sqrt{t-2}, 3, 1/t^2 \rangle$
(b) $r(t) = t^2\mathbf{i} + \cos(t^2)\mathbf{j} + \sin^2(t)\mathbf{k}$

5 *13.2.17* Find the unit tangent vector $T(t)$ at the point $t = 2$: $r(t) = \langle t^2 - 2t, 1 + 3t, 1/3t^3 + 1/2t^2 \rangle$.

6 *13.2.35, 37* Evaluate the integral:

(a) $\displaystyle\int_0^2 \Big(t\mathbf{i} - t^3\mathbf{j} + 3t^5\mathbf{k}) \Big) dt$

(b) $\displaystyle\int_0^1 \Big(\frac{1}{t+1}\mathbf{i} + \frac{1}{t^2+1}\mathbf{j} + \frac{t}{t^2+1}\mathbf{k} \Big) dt$

7 *13.2.49* Find $f'(2)$, where $f(t) = u(t) \cdot v(t), u(2) = \langle 1, 2, -1 \rangle$, $u'(2) = \langle 3, 0, 4 \rangle$ and $v(t) = \langle t, t^2, t^3 \rangle$.

8 *13.2.27* Find a vector equation for the tangent line to the curve of intersection of the cylinders $x^2 + y^2 = 25$ and $y^2 + z^2 = 20$ at the point $(3, 4, 2)$.