Calc 3 - Assignment #10

Note Title 9/21/2011

(1) Find the length of the curve:

a) $r(t) = \langle 2\sin(t), 5t, 2\cos(t) \rangle$, $-10 \le t \le 10$

b) $r(t) = \langle 2t, t^2, \frac{1}{3}t^3 \rangle$, $0 \le t \le 1$

c) $r(t) = \langle 12t, 8t^{3/2}, 3t^2 \rangle$, $0 \le t \le 1$

(2) Suppose you start at the point $(0, 0, 3)$ and move 5 units along the curve $\vec{r}(t) = \langle 3\sin(t), 4t, 3\cos(t) \rangle$ in the positive direction. Where are you now?

(3) Find the unit tangent vector $\vec{T}(t)$:

a) $\vec{r}(t) = \langle 2\sin(t), 5t, 2\cos(t) \rangle$

b) $\vec{r}(t) = \langle t^2, \sin(t) - t\cos(t), \cos(t) + t\sin(t) \rangle$, $t > 0$

c) $\vec{r}(t) = \langle \sqrt{2}t, e^t, e^{-t} \rangle$

(4) Find the curvature:

a) $\vec{r}(t) = \langle t^2, t \rangle$

b) $\vec{r}(t) = \langle 3t, 4\sin(t), 4\cos(t) \rangle$

(5) Show that the circular helix $\vec{r}(t) = \langle a\cos(t), a\sin(t), bt \rangle$, $a > 0, b > 0$, has constant curvature.

Note Title 9/24/2011

(2) Find the unit tangent, the normal, and the curvature:

a) $\vec{r}(t) = \langle t^2, \sin(t) - t\cos(t), \cos(t) + t\sin(t) \rangle$, $t > 0$

b) $\vec{r}(t) = \langle t, \frac{1}{2}t^2, t^3 \rangle$

(3) Find the curvature:

a) $\vec{r}(t) = (t, t, 1+t^2)$

b) $\vec{r}(t) = \langle e^t\cos(t), e^t\sin(t), t \rangle$

(6) Find the vectors T, N, and B for:

a) $\vec{r}(t) = \langle t^2, \frac{2}{3}t^3, t \rangle$ at $(1, \frac{2}{3}, 1)$

b) $\vec{r}(t) = \langle \cos(t), \sin(t), \ln(\cos(t)) \rangle$ at $(1, 0, 0)$

(5) Which of the following curves is the original function $f(x)$, which is its curvature as a function: