# Math 114 Quiz & HW of Week 7 Selected Solutions

Nov 1, 2009

**Quiz 5**

1. 1. Find the length of the curve:

$$\mathbf{r}(t) = \sqrt{2}t\mathbf{i} + e^t\mathbf{j} + e^{-t}\mathbf{k},\ 0 \le t \le 1.$$

$r'(t) = \sqrt{2}i + e^t j - e^t k \Rightarrow |r'(t)| = \sqrt{2 + e^{2t} + e^{-2t}} = \sqrt{(e^t + e^{-t})^2} = e^t + e^{-t}$.
Hence $L = \int_0^1 |r'(t)|dt = \int_0^1 (e^t + e^{-t})dt = e - e^{-1}$.

2.Find the tangential component of the acceleration vector:

$$\mathbf{r}(t) = (3t - t^3)\mathbf{i} + 3t^2\mathbf{j}.$$

$\mathbf{r}(t) = (3t - t^3)\mathbf{i} + 3t^2\mathbf{j} \Rightarrow \mathbf{r}'(t) = (3 - 3t^2)\mathbf{i} + 6t\mathbf{j}$,
$|\mathbf{r}'(t)| = \sqrt{(3 - 3t^2)^2 + (6t)^2} = 3 + 3t^2$,
$\mathbf{r}''(t) = -6t\mathbf{i} + 6\mathbf{j},\ \mathbf{r}'(t) \times \mathbf{r}''(t) = (18 + 18t^2)\mathbf{k}$.
Then Equation 9 gives $a_T = 6t$ (Equation 8 also works.)

**HW7:**

I graded 15.2 #16, 15.3 #36 for correctness and others for completion.

week 7
15.2
10. Does not exist.
16. We can use the Squeeze Theorem to show that the limit is 0:
$0 \le \frac{x^2 + \sin^2 y}{x^2 + 2y^2} \le \sin^2 y$, then take the limit. Another way is, by Ethan Aaron, using polar coordinates. Letting $r \to 0^+$, we also get 0.
34. $G(x,) = g(f(x,y))$ where $f(x,y) = (x+y)^2$, a rational function that is continuous on $\mathbb{R}^2$ except where $x + y = 0$, and $g(t) = \tan^{-1} t$, continuous everywhere. Thus $G$ is continuous on its domain$\{(x,y)|x + y \ne 0\}$.
38. By letting $x = 0$ and $x = y$ respectively, you can see that $f$ is not continuous at $(0,0)$.
40. 0

15.3
22.$f(x,) = x^y \Rightarrow f_x(x,y) = yx^{y-1}, f_y(x,y) = x^y \ln x$.
28.Use the fundamental Theorem of Calculus.
$f_x(x,y) = \frac{\partial}{\partial x}\int_y^x \cos(t^2)dt = \cos(x^2),\ f_y(x,y) = -\cos(y^2)$.
36. $f_x(x,y,z,t) = \frac{y^2}{t+2z}$ $f_y(x,y,z,t) = \frac{2xy}{t+2z}$ $f_z(x,y,z,t) = -\frac{2xy^2}{(t+2z)^2}$
$f_t(x,y,z,t) = -\frac{xy^2}{(t+2z)^2}$