Quiz 2 (front and back)

Name: ~KEY~

1. Let $\mathbf{a} = \mathbf{i} - \mathbf{j} - \mathbf{k}$ and $\mathbf{b} = 2\mathbf{i} - \mathbf{j} + 4\mathbf{k}$.

   (a) Find the cross product $\mathbf{a} \times \mathbf{b}$.

$\langle -5, -6, 1 \rangle$

   (b) Find the equation of the line parallel to $\mathbf{a} \times \mathbf{b}$ and through the point $(-1, 4, 3)$.

$x = -1 - 5t$

$y = 4 - 6t$

$z = 3 + t$

2. Let $\mathbf{r}(t) = \langle e^{\sin t}, \cos(\cos t), 1 - t^{-1} \rangle$. Find each of the following:

Note: These quantities may or may not exist. If something doesn't exist, state that and then clearly explain why.

(a) The domain of $\mathbf{r}$.

$t \neq 0$

(b) $\lim_{t \to 0} \mathbf{r}(t)$. does not exist:

$\lim_{t \to 0^-} 1 - \frac{1}{t} = \infty$ but

$\lim_{t \to 0^+} 1 - \frac{1}{t} = -\infty$.

(c) The unit tangent vector at $t = \pi$.

$\vec{r}'(t) = \langle \cos t\, e^{\sin t}, -\sin(\cos t) \cdot -\sin t, \frac{1}{t^2} \rangle$

$\Rightarrow \vec{r}'(\pi) = \langle -1, 0, \frac{1}{\pi^2} \rangle$

$\Rightarrow$ unit tangent vector is $\frac{\vec{r}'(\pi)}{|\vec{r}'(\pi)|} = \frac{\langle -1, 0, \frac{1}{\pi^2} \rangle}{\sqrt{1 + \frac{1}{\pi^4}}}$