

Please show **all** your work and write your answer on the answer line unless otherwise indicated by the problem. Please read the questions carefully. You have 20 minutes for the quiz.

Name: _____ ID number _____

1. (5pts) Find a unit vector $u = \langle x, y, z \rangle$ in the direction opposite of $\langle -4, -7, -4 \rangle$.

x component of u : _____

y component of u : _____

z component of u : _____

This is just $-\frac{1}{\|u\|}u$, the norm of u is $\sqrt{16 + 49 + 16} = \sqrt{81} = 9$, therefore we get:

$$u = \frac{-1}{9}\langle -4, -7, -4 \rangle$$

2. (5pts) List the values of t between -4 and 4 such that the parametric equation $x = te^t$, $y = \pi t + \sin \pi t$ has a horizontal tangent.

We would like to find where $dy/dt = 0$, note that

$$\frac{dy}{dt} = \pi + \pi \cos \pi t = \pi(1 + \cos \pi t)$$

This has zeros when $\cos \pi t = -1$ which is all odd numbers, therefore $t = -3, -1, 1, 3$. However we need to check when $dx/dt = 0$, this is at the points:

$$dx/dt = e^t + te^t = e^t(1 + t) = 0$$

note that at $t = -1$ we have that slope is vertical, therefore there is no tangent at the point $t = -1$, so the final answer is $t = -3, 1, 3$

$t =$ _____