Math 2153 - Spring 2017   Name: _____

Quiz 3 - Take Home (10 pts)   Recitation Time: _____

SHOW ALL WORK!!! Unsupported answers might not receive full credit. Furthermore, give me EXACT answers (do NOT use your calculator), and do each computation completely. DO NOT leave anything in dot product or cross product form. You will lose points by doing so.

<u>Problem 1</u> [9 pts] Consider the curve $\mathbf{r}(t) = \langle 5\cos t, 5\sin t, 12t \rangle$.

(a). [0.5 pts] Calculate the unit tangent vector $\mathbf{T}(t)$.

(b). [0.5 pts] Calculate the unit normal vector $\mathbf{N}(t)$.

(c). [0.5 pts] Compute the curvature κ at any time t.

(d). [0.5 pts] Calculate the unit binormal vector $\mathbf{B}(t)$.

(e). [1 pt] Calculate the formula for the torsion τ for any time t.

(f). [3 pts] Give the equations for the osculating planes for the curve at $t = 0$ and $t = \frac{\pi}{2}$.

(g). [3 pts] Find the parametric description $\mathbf{R}(t)$ for the line of intersection of the two osculating planes found in part (f).

Problem 2 [1 pt] Sketch four level curves for the function $z = e^{-x-y}$ in the same xy-plane. You are encouraged to NOT pick integer values for your level curves; pick numbers that make the graphing as easy as possible.