Math 2153 - Spring 2017 Name: ______________________

Quiz 2 - Take Home (10 pts) Recitation Time: ______________________

SHOW ALL WORK!!! Unsupported answers might not receive full credit.

Problem 1 [0.5 pts] State the formula for $\frac{d}{dt}[f(t)\mathbf{r}(t)]$ where f is a scalar-valued function and $\mathbf{r}$ is a vector-valued function. Do not write $\mathbf{r}(t)$ as a pair of components $\mathbf{r}(t) = \langle x(t), y(t)\rangle$ and distribute $f(t)$.

Problem 2 [1.5 pts] Evaluate the limit $\lim_{t\to 0}\left(\frac{1-\cos t}{t}\mathbf{i} - \frac{e^{2t}-t-1}{t}\mathbf{j} + \frac{\cos t + t^2/2 - 1}{t^2}\mathbf{k}\right)$

Problem 3 [4 pts] Consider the curve $\mathbf{r}(t) = \langle 2\sin 2t, 3t, 2\cos 2t\rangle$ for $0 \le t \le 4$.

(a). [2 pts] Find a formula for the arc length for the arc length $s(t)$ in general.

(b). [2 pts] State whether the curve is parametrized by arc length and how you know [0.5 pts]. If it is not parametrized by arc length, find another description of the curve that uses arc length as a parameter [1.5 pts].

Problem 4 [4 pts] Suppose that the acceleration of a projectile is given by the vector-valued function $\mathbf{a}(t) = \langle te^t, \sin^2 t, \frac{1}{t+1} \rangle$ for $t \geq 0$, and suppose the initial position and velocity are given by $\mathbf{r}(0) = \langle 2, \frac{1}{2}, 1 \rangle$ and $\mathbf{v}(0) = \langle 2, 2, 2, \rangle$, respectively. Find the value of the position function $\mathbf{r}$ for all values of $t \geq 0$, i.e. find $\mathbf{r}(t)$. Show your work. Citing an online integral calculator or a table of integrals will award you no credit for the evaluation of the integral(s).