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. For the curve given by $r(t) = \langle -\sqrt{18}t, e^{-3t}, e^{3t} \rangle$, write in the following blanks, in simplified terms, the following expressions.

   (a) $r'(t) = \langle \quad , \quad , \quad \rangle$

   (b) $r''(t) = \langle \quad , \quad , \quad \rangle$

   (c) the curvature at $t = 0$: $\kappa(0) =$ ____________

   (d) the length of the curve from $t = 0$ to $t = 1$: ____________

$$r'(t) = \langle -\sqrt{18}, -3e^{-3t}, 3e^{3t} \rangle$$
$$r''(t) = \langle 0, 9e^{-3t}, 9e^{3t} \rangle$$

So

$$\kappa = \frac{\|r' \times r''\|}{\|r'\|^3}$$

$$\|r'(0) \times r''(0)\| = 27\sqrt{6}$$

therefore:

$$\kappa(0) = \frac{\sqrt{2}}{4}$$

and:

$$\int_0^1 \sqrt{18 + 9e^{-3t} + 9e^{3t}}dt = \int_0^1 3e^{3t} + 3e^{-3t}dt = e^3 - e^{-3}$$

2. Find the limits, if they exist for:

$$\lim_{(x,y)\to(0,0)} \frac{3x^2}{3x^2+y^2}$$

(a) Along the $x$-axis: ___________

(b) Along the line $y = mx$: ___________

(c) The limit is: ___________

(d) Would it be possible to find values of $x$ and $y$ such that $(x^2+y^2) < 10^{-200}$ but $\left|\frac{3x^2}{3x^2+y^2} - 1\right| > 1/2$? ________________

(a) 1

(b) $\dfrac{3}{3+m^2}$

(c) does not exist

(d) yes, because along the $y$ axis, the function goes to 0, therefore aribtrarily close to 0, the function will go close to 1 and 0 depending how you approach it. Therefore you can always find points that are greater than 1/2 away from 1.

The End.