Name: SOLUTIONS

241S1 Quiz #3 - September 22, 2015, 10 a.m.

1. Let $\vec{r}(t) = (t, 2\cos t, 2\sin t)$, $-4 \le t \le 4$. Find the length of the curve.

$\vec{r}'(t) = (1, -2\sin t, 2\cos t)$ $\quad |\vec{r}'(t)| = \sqrt{1 + 4\sin^2 t + 4\cos^2 t} = \sqrt{5}$

$$AL = \int_{-4}^{4} \sqrt{5}\, dt = 8\sqrt{5}$$

2. Let $\vec{r}(t) = (t, t^2, e^t)$. Find an equation for the unit tangent vector $\vec{T}(t)$.

$\vec{r}'(t) = (1, 2t, e^t)$

$|\vec{r}'(t)| = \sqrt{1 + 4t^2 + e^{2t}}$

$$\vec{T}(t) = \frac{1}{\sqrt{1 + 4t^2 + e^{2t}}} (1, 2t, e^t)$$

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241S1 Quiz #3 - September 22, 2015, 10 a.m.

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Name: SOLUTION

241S2 Quiz #3 - September 24, 2015, 11 a.m.

1. The position function of a particle is given by $\vec{r}(t) = (t^2, 5t, t^2 - 2t)$. When is the speed a minimum (Hint: minimize the square)?

$\vec{r}'(t) = (2t, 5, 2t-2)$ $\quad |\vec{r}'(t)| = \sqrt{4t^2+25+4t^2-8t+4}$

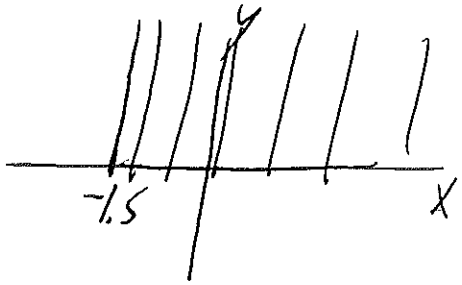
so $(\text{speed})^2 = 8t^2-8t+29$, set derivative equal to zero

$16t-8=0$

$t = 1/2$

2. Find and sketch the domain of the function $f(x,y) = \sqrt{2x+3} + \sqrt{y}$..

Need $y \geq 0$ and $2x+3 \geq 0$ so $x \geq -1.5$



Name:

241S2 Quiz #3 - September 24, 2015, 11 a.m.

1. The position function of a particle is given by $\vec{r}(t) = (t^2, 5t, t^2 - 2t)$. When is the speed a minimum (Hint: minimize the square)?

2. Find and sketch the domain of the function $f(x,y) = \sqrt{2x+3} + \sqrt{y}$..

Name: SOLUTIONS

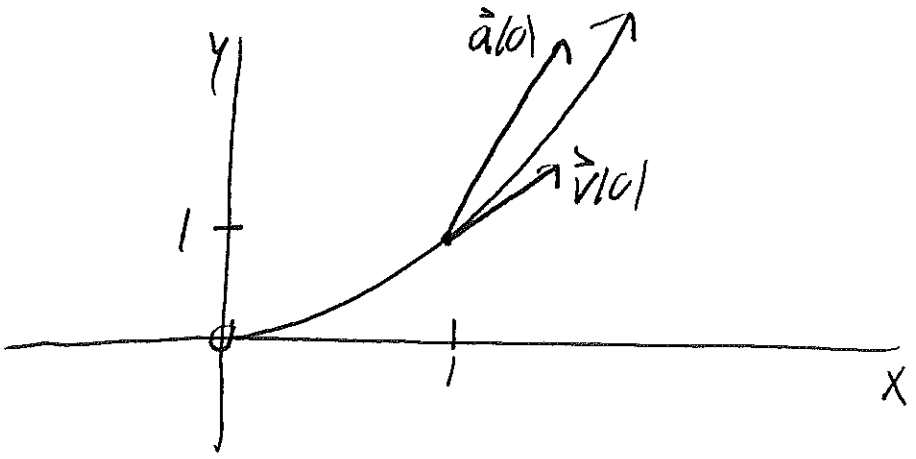
241S3 Quiz #3 - September 24, 2015, 10 a.m.

1. Let $\vec{r}(t) = (e^t, e^{2t})$. Find the velocity, acceleration and speed of a particle with the given position function. Sketch the path of the particle and draw the velocity and acceleration vectors for $t = 0$.

$\vec{v}(t) = \langle e^t, 2e^{2t} \rangle$ Speed $= |\vec{v}(t)| = \sqrt{e^{2t} + 4e^{4t}}$

$\vec{a}(t) = \langle e^t, 4e^{2t} \rangle$

Note $\vec{r}(t)$ lies on $y = x^2$ and only for $x > 0$



~~$\vec{v}(t) = \langle e, 2e^2 \rangle$~~

~~$\vec{a}(t) = \langle e, 4e^2 \rangle$~~

$\vec{v}(0) = \langle 1, 2 \rangle$

$\vec{a}(0) = \langle 1, 4 \rangle$

2. Let $f(x, y) = y - 2x^2$. Sketch and neatly label the level curves for $k = 0, 1, 4$.

$k = 0 \quad y = 2x^2$

$k = 1 \quad y = 2x^2 + 1$

$k = 4 \quad y = 2x^2 + 4$