MATH 202 Name: SOLUTIONS

Quiz 3 February 5, 2020

Instructions: Five points total.

1. (1 pt.) Describe carefully, but in your own words, why the definition of arc length on a curve $\mathbf{r}(t)$ from time $t = a$ to $t = b$ is given by the formula below:

$$L = s = \int_a^b |\mathbf{r}'(t)|dt.$$

Speed · time = distance

The integrand is the "instantaneous" distance traveled along $\vec{r}(t)$. By integrating this from times $t=a$ until $t=b$, you get the distance along $\vec{r}(t)$, or arc length.

2. (4 pts.) Consider the surface defined by

$$4x^2 - y^2 + 2z^2 + 4 = 0.$$

(Hint: Before answering these questions, you should probably convert this equation to standard form. The space below is for scratch work.)

If you like standard form.

$$4 = -4x^2 + y^2 - 2z^2$$

$$1 = -x^2 + \frac{y^2}{4} - \frac{z^2}{2}$$

$$\boxed{z=0 : \ 1 = -x^2 + \frac{y^2}{4}}$$

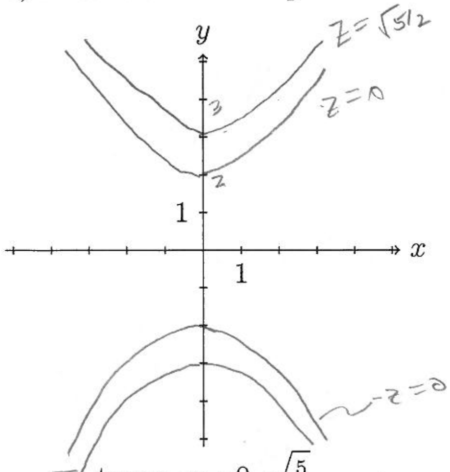
$$z = \sqrt{5/2} : \quad 1 = -x^2 + \frac{y^2}{4} - \frac{(\sqrt{5/2})^2}{2}$$

$$1 = -x^2 + \frac{y^2}{4} - \frac{5}{4}$$

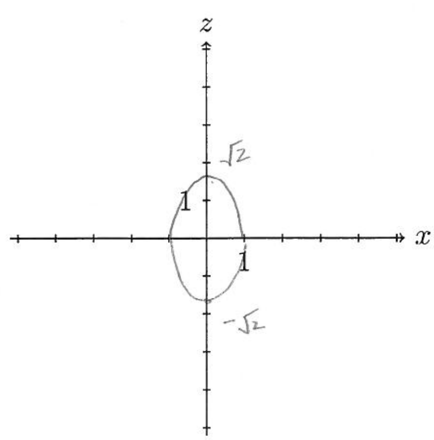
$$z = \sqrt{5/2}$$

$$\boxed{\frac{9}{4} = -x^2 + \frac{y^2}{4}}$$

a) Draw the traces requested on the axes below.



trace: $z = 0, \sqrt{\frac{5}{2}}$



trace: $y = \sqrt{8}$

$y = \sqrt{8}$:

$$1 = -x^2 + \frac{8}{4} - \frac{z^2}{2}$$

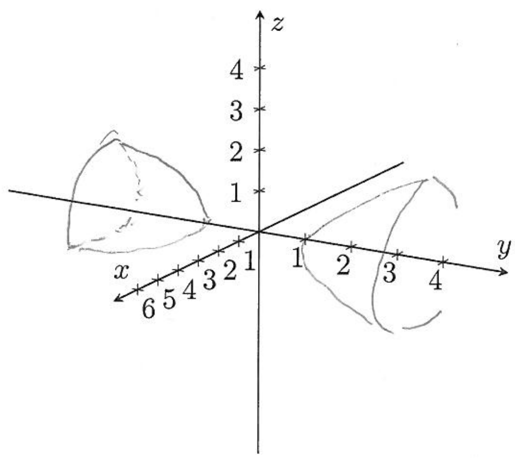
$$\boxed{y=\sqrt{8} \quad x^2 + \frac{z^2}{2} = 1}$$

Part b) is on the next page.

$$4x^2 - y^2 + 2z^2 + 4 = 0.$$

b) Sketch the surface on the axes below. (Give it a name if you can.)

Hyperboloid of 2 Sheets



(space for scratch work)