Mat 397 Spring 2016 Quiz 3 Name: Caleb McWhorter Score: $\overline{\phantom{10}}$ 10

Solutions

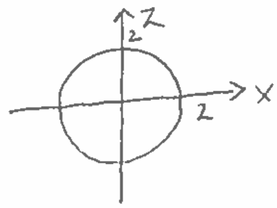
1. (5 Points) Consider the quadratic surface $x^2 + z^2 - y^2 = 4$.

(a) Sketch the trace in the $xz$-plane

In $xz$-plane, $y=0$:

$x^2 + \cancel{y}^2 - 0^2 = 4$

$x^2 + z^2 = 4$

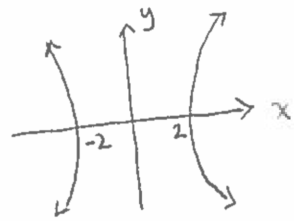



(b) Sketch the trace in the $xy$-plane.

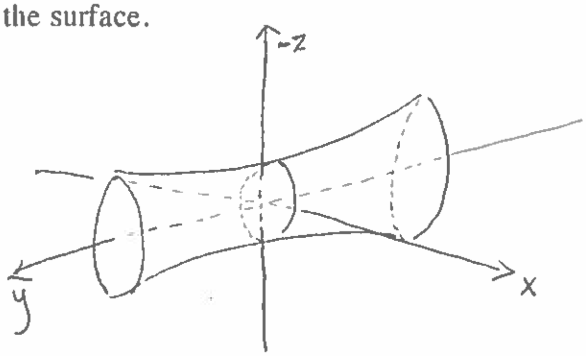
In $xy$-plane, $z=0$:

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

$x^2 - y^2 = 4$




(c) Sketch the surface.




Hyperboloid of one sheet

2. (2 Points.) For the vector valued function $\bar{r}(t) = \left\langle 2\cos 3t,\ \frac{t^2-4}{t+2},\ \frac{\sin t}{5t} \right\rangle$, compute $\lim\limits_{t\to 0} \bar{r}(t)$.

$$\lim_{t\to 0} \vec{r}(t) = \left\langle \lim_{t\to 0} 2\cos 3t,\ \lim_{t\to 0} \frac{t^2-4}{t+2},\ \lim_{t\to 0} \frac{\sin t}{5t} \right\rangle$$

$$= \langle 2, -2, 1/5 \rangle$$

(b) If $\bar{r}(t) = \langle 2e^t,\ \cos(t^2),\ 3 + \sin 5t \rangle$, find the derivative $\frac{d\bar{r}}{dt} = \bar{r}\,'(t)$

$$\frac{d}{dt} \vec{r}(t) = \left\langle \frac{d}{dt} r_1(t),\ \frac{d}{dt} r_2(t),\ \frac{d}{dt} r_3(t) \right\rangle$$

$$= \langle 2e^t, -2t\sin t^2, 5\cos 5t \rangle$$