Name: ______________________ **Section**: ______________

Clear your desk of everything excepts pens, pencils and erasers. **Show all your work.**
If you have a question raise your hand and I will come to you.

1. **Fill-in-the-Blank. No work needed. No partial credit available**

   Identify the following quadric surfaces from the list: *Cylinder, Elliptical Cone, Elliptical Paraboloid, Ellipsoid, Hyperbolic Paraboloid, Hyperboloid of 1 sheet, Hyperboloid of 2 sheets.*

   (a) (2 points) Elliptical Cone ______________________ describes $z^2 + y^2 = \frac{x^2}{4}$.

   (b) (2 points) Ellipsoid ______________________ describes $z^2 + \frac{y^2}{100} + x^2 = 3$.

   (c) (2 points) Hyperboloid of 1 sheet ______________________ describes $x^2 + y^2 - z^2 = 5$.

Extra Work Space.

Continue on to back side

2. (a) (2 points) Find a vector function for the curve of intersection between the cylinder $x^2+y^2=4$ and the plane $x+y+z=4$. Remember to include bounds for t.

Solution: From Calc 2 we know $x=2\cos t$ and $y=2\sin t$ well satisfy $x^2+y^2=4$. Plugging these parametrizations into $x+y+z=4$ we can solve for z.

$$\begin{aligned} x+y+z &= 4 \\ 2\cos t+2\sin t+z &= 4 \\ z &= 4-2\cos t-2\sin t \end{aligned}$$

Giving us the final solution $\boxed{\mathbf{r}(t)=\langle 2\cos t, 2\sin t, 4-2\cos t-2\sin t\rangle}$.

(b) (2 points) Find the derivative of the vector function at $t=\pi$.

Solution:

$$\begin{aligned} \mathbf{r}(t) &= \langle 2\cos t, 2\sin t, 4-2\cos t-2\sin t\rangle \\ \mathbf{r}'(t) &= \langle -2\sin t, 2\cos t, 2\sin t-2\cos t\rangle \\ \mathbf{r}'(\pi) &= \boxed{\langle 0,-2,2\rangle} \end{aligned}$$