Name: Erik Sundblad **Worksheet 12**

**Exercise 1.** Consider the function $\mathbf{r}(t) = \langle 2\cos t, 2\sin t, 4t\rangle$, for $t \geq 0$. Find the arclength for $0 \leq t \leq 2$.

$$L = \int_a^b |r'(t)| = \int_0^2 \sqrt{(-2\sin)^2 + (2\cos^2) + 4^2}\,\Big|_0^2 \quad \sqrt{4(1+4}\,\Big|_0^2 \quad \sqrt{5}$$

$4\sin^2 + 4\cos + 4\cdot 4 = 4(1+4)$

arc length as param

$2\sqrt{5}\cdot 2 - \sqrt{5}\cdot 0 = \boxed{4\sqrt{5}}$

$s(t) = \int_0^t |r'(u)|\,du \to 2\sqrt{5}t - 2\sqrt{5}$ Ca

$a = 0$

$t = \frac{s}{2\sqrt{5}}$

**Exercise 2.** Determine the $xy$-trace and the $(z = 3)$-trace. Then name and sketch the surface.

$(x,y)$ $z=0$

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