

Math 2210-5 Extra Problem for Parameterized Curves

Due with Problem 133. This is **NOT** an extra credit problem. You should turn it in with the rest of your homework.

We will be exploring a particularly interesting class of parametric curves. They are all given by the parameterizations:

$$\begin{aligned}x &= \left(2 + \cos\left(\frac{pt}{q}\right)\right) \cos t \\y &= \left(2 + \cos\left(\frac{pt}{q}\right)\right) \sin t \\z &= \sin\left(\frac{pt}{q}\right),\end{aligned}$$

where p , and q are integer constants, and $0 \leq t \leq 2q\pi$.

1. Use Maple to explore the shapes of these curves. The code below will get you started:

```
restart;
with(plots):
p:=3:
q:=2:
tubeplot([(2+cos(p*t/q))*cos(t), (2+cos(p*t/q))*sin(t), sin(p*t/q)],
t=0..2*q*Pi, scaling=CONSTRAINED, numpoints=200, radius=0.1);
```

Note that `tubeplot` thickens the curve so that you can more easily see it. You may also try using `spacecurve`.

2. Play around with the values of p and q . Be sure to use integers. What can you say about all of these curves? Can you make any conjectures?