Preface

Here are a set of problems for my Calculus I notes. These problems do not have any solutions available on this site. These are intended mostly for instructors who might want a set of problems to assign for turning in. I try to put up both practice problems (with solutions available) and these problems at the same time so that both will be available to anyone who wishes to use them.

### Surface Area with Parametric Equations

For all the problems in this section you should only use the given parametric equations to determine the answer.

For problems 1 – 4 determine the surface area of the object obtained by rotating the parametric curve about the given axis. For these problems you may assume that the curve traces out exactly once for the given range of \( t \)’s.

1. Rotate \( x = t^2 - 3 \quad y = 2 + t^3 \quad 0 \leq t \leq 5 \) about the \( x \)-axis.

2. Rotate \( x = -8t \quad y = 6 + t^2 \quad -3 \leq t \leq 0 \) about the \( y \)-axis.

3. Rotate \( x = t^2 \quad y = t^4 - 2 \quad 0 \leq t \leq 2 \) about the \( y \)-axis.

4. Rotate \( x = 2 + t \quad y = 4e^{-\frac{1}{4}t} \quad -1 \leq t \leq 2 \) about the \( x \)-axis.

For problems 5 – 7 set up, but do not evaluate, an integral that gives the surface area of the object obtained by rotating the parametric curve about the given axis. For these problems you may assume that the curve traces out exactly once for the given range of \( t \)’s.

5. Rotate \( x = 2 + e^{\cos(t)} \quad y = 1 + t^2 \quad -2 \leq t \leq 0 \) about the \( x \)-axis.

6. Rotate \( x = \cos^2(t) \quad y = 2 \cos(2t) - \sin(t) \quad 0 \leq t \leq 1 \) about the \( y \)-axis.

7. Rotate \( x = t^2 \quad y = \ln\left(3 + e^{-t}\right) \quad 0 \leq t \leq 2 \) about the \( x \)-axis.