MATH 1700 D01 Summer 2015 Assignment 5

SHOW ALL WORK to get full marks. Leave answers as exact answers. For example, leave it as e^2 as opposed to a decimal approximation. Simplify your answers as much as possible.

1. Find the arc length of the curve

$$y = \frac{x^3}{6} + \frac{1}{2x}, \quad 1 \leq x \leq 3.$$

2. Find the area obtained by rotating the curve $g(x)$ defined by

$$g(x) = \int_1^x \sqrt{t^5 - 1}dt, \quad 1 \leq x \leq 4$$

about the y-axis.

3. Find the area obtained by rotating the curve $y = 4 + x^2$, from $0 \leq x \leq 1$ about the y-axis.

4. For the parametric curve $x = \frac{4}{3}t^3 - t, y = 2t^2 + 4$

   (a) Find dy/dx in terms of t.

   (b) Find the equation of the tangent line to the curve at the point $(-33, 22)$.

   (c) Find the point(s) on the curve where the tangent line to the curve at that point is horizontal.

   (d) Find the point(s) on the curve where the tangent line to the curve at that point is vertical.

5. For the parametric curve in the previous question , find the length of the curve from $(0, 4)$ to $\left(\frac{1}{3}, 6\right)$.

6. For the curve $x = 5t - t^3, y = \sqrt{15}t^2$

   (a) Show the curve crosses itself at the point $(0, 5\sqrt{15})$. (Hint: Find two different values of t which give the same point and show that the tangent lines at those values are different)

   (b) Find the length of the loop in the parametric curve (a sketch would be helpful, but is not required for marks)