Math 2565 - Tutorial 5

Review for Test 2 and Differential Equations

You will work in your groups via the Zoom breakout rooms to answer the following 2 questions. Try to use the collaboration spaces on OneNote, so your progress can be monitored throughout the session and everyone can contribute. You will only need to submit your answers your answers to questions 2 and 3. Also note for question 2 you don't need to submit your Juypter notebook, just report your results on paper.

Solutions to the problems will be uploaded directly after the 2nd tutorial session.

1 (Review for Test 2)

(a) Find the volume of the solid generated when the area contained between the curve $y = x^2 - 1$ and the x-axis is rotated about the x-axis.

(b) Find the arc length of $f(x) = \frac{1}{3}(x^2+2)^{\frac{3}{2}}$ from $x = 0$ to $x = 1$.

(c) Consider the graphs of $f(x) = \sqrt{2x - x^2}$ on the interval $0 \le x \le 2$. Compute the area of the surface of revolution formed by revolving this graph about the x-axis.

2 (Euler Method) Using the Juypter notebook on Moodle, approximate the solution to

$$\frac{dy}{dx} = \frac{y+x}{y-x},$$

using the Euler method on the interval $[0, 1]$ for 11 points subject to the initial condition $y(0) = 1$.

The particular solution to the differential equation is

$$y = \sqrt{2x^2+1} + x,$$

so check your implementation of the Euler method by plotting both the exact answer and your approximations on the same plot.

3 (Separable Differential Equations)

(a) Find the particular solution of the following differential equation

$$\frac{dy}{dx} = \frac{3x^2+4x-4}{2y-4},$$

subject to the initial condition $y(1) = 3$.

(b) Find the particular solution of the following differential equation

$$\frac{dy}{dx} = \tan y,$$

subject to the initial condition $y(0) = \frac{\pi}{6}$. Check your answer using the Euler method on the Juypter notebook for the interval $[0, 0.5]$ with 11 points.