Math 104

Final Exam Spring 2021

First and Last Name _____(PRINT)   Penn ID_____

This exam has 8 questions. Each question is worth 10 points for a total of 80 points. Partial credit will be given for the entire exam so be sure to show all work. Circle or Box your final answer and give supporting work, a correct answer with little or no supporting work will receive little or no credit. Use the space provided to show all work.

You have **75 minutes** to complete the exam. You are not allowed the use of a calculator or any other electronic device. You are allowed to use the front and back of a standard 8.5"X11" sheet of paper for handwritten notes. Please silence and put away all cell phones and other electronic devices. When you finish, please stay seated until the entire 120 minutes has elapsed

Once you have completed the exam, sign the academic integrity statement below.
Do **NOT** write in the grid below. It is for grading purposes only.

Problem	Points
1	
2	
3	
4	
5	
6	
7	
8	
Total	

 My signature below certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination paper.

_____
Name (printed)

_____
Signature

_____

1. Find the degree 14 Taylor approximation about $x = 0$ of the function

$$f(x) = \frac{d}{dx} \int_0^{x^3} \cos\left(t^2\right) dt.$$

2. Determine whether the following series converges or diverges.

I. $\displaystyle\sum_{n=1}^{\infty} \frac{n+2}{n^3 - n + 1}$

II. $\displaystyle\sum_{n=1}^{\infty} \left(\frac{1+2n}{1+n}\right)^n$

3. Find the interval of convergence for

$$\sum_{n=3}^{\infty} \frac{(x-1)^n}{n-\sqrt{n}}$$

4. Solve the initial value problem

$$-\pi\frac{dy}{dx} = \frac{y^2}{1+x^2} \quad \text{with } y(1) = 4$$

Find $y(\sqrt{3})$.

5. Evaluate

$$\int_1^2 \frac{17-x^2}{x^3-8x^2+17x}\,dx.$$

6. Evaluate

$$\int_0^3 \frac{80}{\left(\sqrt{16+x^2}\right)^3}\, dx.$$

7. Find the value of k so that the function below is a probability density function

$$f(x) = \begin{cases} kxe^{2x} & 0 \le x \le \frac{1}{2} \\ 0 & \text{otherwise} \end{cases}$$

8. Find the volume of the solid generated by revolving the region in the first quadrant bounded by $y = 1 - x^2$, $x = 0$, $y = 0$ about the line $x = 3$.