University of California, San Diego
Department of Mathematics

Instructions

1. **Write your *Name*, *PID*, *Section*, and *Exam Version* on the front of your Blue Book.**
2. **No calculators or other electronic devices are allowed during this exam.**
3. **You may use one page of notes, but no books or other assistance during this exam.**
4. **Read each question carefully, and answer each question completely.**
5. **Write your solutions clearly in your Blue Book.**
   (a) **Carefully indicate the number and letter of each question and question part.**
   (b) **Present your answers in the same order they appear in the exam.**
   (c) **Start each problem on a new page.**
6. **Show all of your work. No credit will be given for unsupported answers, even if correct.**
7. **Turn in your exam paper with your Blue Book.**

DO NOT TURN OVER UNTIL INSTRUCTED TO DO SO

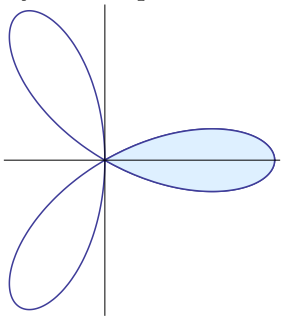
Question Zero:

0. (2 points) Carefully read and complete the instructions at the top of this exam sheet and any additional instructions written on the chalkboard during the exam.

(This exam is worth 80 points.)

1. (10 points) Find the volume of the solid with the given base and cross-sections: The base is the region enclosed by $y = x^{3/2}, y = 1$, and $x = 0$. The cross-sections perpendicular to the x-axis are semicircles. (*Hint:* Sketch the base of the solid object.)

2. (8 points) Find the area enclosed by one loop of the three-leafed polar rose $r = 4\cos(3\theta)$.



3. (10 points) Evaluate the indefinite integral:

$$\int e^{6x}\cosh(2x)\,dx$$

4. (10 points) Evaluate the improper integral or show that it does not converge:

$$\int_0^{\ln(3)} \frac{e^x}{(e^x-1)^{1/2}}\,dx$$

5. (12 points) Compute the indefinite integral:

$$\int \frac{x^2+1}{x^2(x^2-1)}\,dx$$

6. (8 points) Determine if the following series converges or diverges. State which test you used and make sure to verify all conditions required by that test.

$$\sum_{n=2}^{\infty}\Big[1-\cos(1/n)\Big]$$

7. (8 points) Determine if the following series converges or diverges. State which test you used and make sure to verify all conditions required by that test.

$$\sum_{n=2}^{\infty}\frac{(-1)^n}{\ln(n)}$$

8. (12 points) Find the radius of convergence and the interval of convergence for the following power series:

$$\sum_{n=1}^{\infty}\frac{(-4)^n}{n}(x-1)^{2n}$$