

Name: _____ PID: _____

- Print your **NAME** on every page and write your **PID** in the space provided above.
 - Show all of your work for a problem on the page where that problem appears. No credit will be given for unsupported answers, even if correct.
 - No calculators, tablets, phones, or other electronic devices are allowed during this exam. You may use one page of handwritten notes, but no books or other assistance.
 - Sit in your **ASSIGNED** seat.
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Do not turn this page until instructed to do so.

(2 pt) 0. (Question Zero) Follow the instructions on this exam and any additional instructions given during the exam.

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- (6 pt) 1. Let $z = \frac{\sqrt{2}}{2} + i\frac{\sqrt{2}}{2}$ and the $w = 2e^{\pi i/3}$. Write each of the following in the form $a + ib$ where a and b are real numbers. Clearly label which part of your work goes with (a), (b), and (c).
- (a) $\frac{1}{z}$ (b) z^{80} (c) $z^2 w$

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- (4 pt) 2. Use the limit definition of an improper integral to compute the integral or to show it diverges:

$$\int_0^2 \frac{3}{x^2} dx$$

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- (6 pt) 3. The region bounded by the the curve $y = \sqrt{\frac{x+1}{x^3}}$ and the x -axis on the interval $[1, \infty)$ is rotated about the x -axis. Find the volume of this solid if it is finite, or show that it is not.

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(6 pt) 4. Evaluate the indefinite integral $\int \left(e^{-3x} \cosh(3x) - \frac{1}{2} \right) dx$.

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- (6 pt) 5. Let $f(x) = \int_7^x \sin(1 + t^2) dt$ and evaluate $\int f(x) dx$. The function f may appear in your answer. (Do not use power series.)

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- (8 pt) 6. Determine if each series converges or diverges. You must justify your answer. State which test you use and explicitly check that all conditions are met. Clearly indicate which parts of your work belong to (a) and (b).

(a) $\sum_{n=5}^{\infty} \frac{1}{\sqrt{3n^4 - 1}}$ (b) $\sum_{n=3}^{\infty} (-1)^{n-1} \frac{\ln(n)}{n}$

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(6 pt) 7. Determine the radius of convergence for the power series $\sum_{n=2}^{\infty} \frac{(2x)^n}{n\sqrt{\ln(n)}}$.

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(6 pt) 8. Compute $\int te^{2t^3} dt$. (Your answer may be in the form of a power series.)

You may use this page for scratch paper, but nothing written on this page may be used as supporting work.