Instructions:

- Do not open the exam until you are instructed to do so.
- Write your name and student ID number on the front page of the exam.
- Write your name and student ID number at the top of every page of the exam.
- Answer the questions in the space provided, if you run out of room, continue on the back side of the page.
- If you need scratch paper, ask one of the proctors and we will provide it.

Math 20B - Midterm 2 - 11/14/2018

Name & Student ID: ________________________________

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1. (a) (5 points) Compute the complex number \( \frac{1 + \theta^4}{3i} \). Express your answer either in polar coordinates \((r, \theta)\) or as \( re^{i\theta} \).

(b) (5 points) Find the antiderivative:

\[
\int \cos^3(x)\sin^2(x)\,dx.
\]

Show your work!
Extra paper for problem 1.
2. (10 points) Use trigonometric substitution to compute the antiderivative

\[
\int \frac{1}{(x^2 + 4)^{3/2}} \, dx.
\]

Show your work!
Extra paper for problem 2.
3. (10 points) Use partial fractions to evaluate the integral:

$$\int \frac{x^3 + 1}{x^2(x^2 + 1)} \, dx.$$ 

Show your work!
Extra paper for problem 3.
4. (a) (5 points) Evaluate the improper integral
\[ \int_{0}^{\infty} \frac{1}{x^2 + 1} \, dx. \]
Show your work!

(b) (5 points) Determine whether or not the improper integral
\[ \int_{5}^{\infty} \frac{1}{(x^2 + 1)\ln(x)} \, dx \]
converges or diverges. Justify your answer.
Extra paper for problem 4.