Name: _____

Write all of your responses on these exam pages, if you need extra space please use the backs of the pages. Show all your work, answers without supporting justification will not receive credit. Keep your answers in exact form and simplify numerical answers to the point where a scientific calculator could get an approximation. **No calculation devices allowed.**

1. (*20 Points*) Evaluate the following integral.

$$\int_1^\infty xe^{-x^2}\,dx$$

2. (*20 Points*) Find the exact length of the curve $y = \ln(1 - x^2)$ for $0 \leq x \leq \frac{1}{2}$.

3. (*15 Points*) Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} n^2 e^{-n^3}$$

4. (*15 Points*) Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} \frac{\sqrt{n^4+1}}{n^3+n}$$

5. (*15 Points*) Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} \frac{n^2+1}{5^n}$$

6. (*15 Points*) Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} \frac{e^n}{n^2}$$