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, keep your answers in exact form, and each exercise is worth 15 points. **No calculation devices allowed.**

1. Express the integral as a limit of Riemann sums using left endpoints. Then use the properties of sums and limits to evaluate the integral, do not use the Fundamental Theorem of Calculus.

$$\int_1^3 3x^2 + 2x \, dx$$

2. Given that

$$F(x) = \int_x^{x^2} e^{t^2}\, dt$$

find $F'(x)$.

3. Evaluate the following integral

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

4. Evaluate the following integral

$$\int_1^2 x^2 \ln(x)\, dx$$

5. Evaluate the following integral

$$\int x \cos^5(x^2)\, dx$$

6. Evaluate the following integral

$$\int x\sqrt{1-x^4}\,dx$$

7. Evaluate the following integral

$$\int \frac{x-4}{x^2-5x+6}\,dx$$

8. Evaluate the following integral

$$\int_1^\infty \frac{1}{x^2 + x}\, dx$$

9. Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} \frac{3^n n^2}{n!}$$

10. Test the series for convergence or divergence.

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

11. Test the series for convergence or divergence.

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

12. Find the radius of convergence and interval of convergence of the power series.

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

13. Find the Taylor series for $f(x) = \dfrac{1}{x^2}$ centered at $a = 1$, and find the associated radius of convergence. You may assume that f has a power series expansion and you need not verify that $R_n(x) \to 0$.

14. Find the volume of the object that has a circular base with radius r and the parallel cross-sections perpendicular to a diameter of the base are squares.