

CALCULUS CHALLENGE**NAME** _____

1. Find the antiderivative: $\int \frac{x^2 + x - 5}{(x - 1)^2} e^x dx$

2. Find the sum of the series $\sum_{n=1}^{\infty} \frac{n}{2^n}$

3. Evaluate the integral $\int_0^1 \frac{x^4(1-x)^4}{1+x^2} dx$

4. Find $\frac{1 + \frac{1}{2^p} + \frac{1}{3^p} + \frac{1}{4^p} + \dots}{1 - \frac{1}{2^p} + \frac{1}{3^p} - \frac{1}{4^p} + \dots}$, where p is any real number greater than 1.

5. Find $\lim_{n \rightarrow \infty} \frac{1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{n^3}}{\ln n}$ (limit as $n \rightarrow \infty$)

6. Find the smallest value of the constant m such that the function $mx - 1 + \frac{1}{x} \geq 0$ for every $x > 0$.