Calculus

1. Evaluate the integral $\int_0^1 x^2 e^x \, dx$ using integration by parts.

2. Find the limit $\lim_{x \to 0} \frac{\sin(3x)}{x}$.

3. Determine the derivative of the function $f(x) = x^x$.

4. Evaluate the limit $\lim_{x \to \infty} \frac{2x^3 - x + 1}{x^3 + 3x^2}$.

5. Find the second derivative of the function $f(x) = \ln(x^2 + 1)$.