Question 1C. Find the degree 4 Taylor approximation about $x = 0$ of the function below. For your numerical answer, enter the coefficient of x^4.

$$\frac{d}{dx}\int_0^{2x} \cosh(t^2)\,dt$$

Question 2A. The value of $\displaystyle\int_2^3 \frac{3x^2 - 1}{x^3 - x}\,dx$ can be expressed as $\ln k$. Determine k **without** using the substitution $u = x^3 - x$.

Question 3A. Compute the interval of convergence for the power series below.

$$\sum_{n=5}^{\infty} \frac{(x-1)^n}{2^n n(\ln n)^3}$$

- ○ $(-1, 3]$
- ○ $(-3, 1)$
- ○ $[-1, 3)$
- ○ $[-1, 3]$
- ○ $(-1, 3)$
- ○ $[-3, 1]$
- ○ $(-3, 1]$
- ○ $[-3, 1)$

Question 4B. For the curve given parametrically by $x(t) = t^3 \cos\frac{1}{t}$, $y(t) = t^3 \sin\frac{1}{t}$, the arc length for $0 \le t \le A$ is which of the following?

- ○ $\frac{1}{27}(9A^2+1)^{3/2}$
- ○ $\frac{1}{27}\sqrt{9A^2+1}$
- ○ $\left[(9A^2+1)^{3/2} - 1\right]$
- ○ $\frac{1}{27}\left[(9A^2+1)^{3/2} - 1\right]$

Question 5B. The series below converges for all values of p strictly bigger than some number k. Find k. In your written work, justify divergence when $p = k$ and convergence when $p > k$.

$$\sum_{n=1}^{\infty} \left(e^{2/n^p} - 1\right)$$

Question 6C. A continuous function $f(x)$ satisfies $0 \leq f(x)$, for $0 \leq x \leq 1$. When the region between $y = f(x)$ and the x-axis, as x goes from 0 to 1, is rotated around the y-axis, the resulting solid has volume 8π. If $F(x) = \int_0^x f(x)dx$ and $\int_0^1 F(x)dx = 1$, find $F(1)$ (the answer is a whole number).