Question Number	I	IIA	II(B+C)	III	IV	Total
Mark						

Question I: : [21 points]

Evaluate the following integrals:

1. $\int \frac{3^x}{25+3^{2x}}\, dx.$ [3 points]

2. $\int \frac{1}{\sqrt{1-e^{6x}}}\, dx$ [3 points]

3. $\int x^2 \cos(4x)\, dx$ [3 points]

4. $\int \tan^2 x \ \sec^6 x \ dx$ [3 points]

5. $\int \frac{x^3+2x-1}{x^2-1}\, dx$ [3 points]

6. $\int \frac{\sec^2 x}{3+2\tan x+\tan^2 x}\, dx$ [3 points]

7. $\int \frac{1+x^2}{x^2\sqrt{x^2-9}}\,dx$ [3 points]

Question II: [2+3+3=8 points]

A. If

$$F(x) = \int_2^{\ln x} (1+e^t)^4\,dt\,,$$

then find $F'(3)$. [2 points]

B. Find

$$\lim_{x\to+\infty}(1+4x^2)^{\frac{1}{x^2}}.$$ [3 points]

C. Determine whether the improper integral $\int_0^2 \frac{x}{(4-x^2)^{\frac{5}{2}}}\,dx$ converges or diverges. If it converges find its value. [3 points]

Question III: [3+3=6 points]

A. Sketch the region R bounded by the graphs of the functions

$$y = 2 - x^2, \qquad y = 2x - 1\ .$$

Then **find its area.** [3 points]

B. **Find the volume** of the solid obtained by revolving the region bounded by

$$y = \ln x\,, \qquad y = 0, \qquad x = 1 \ \ and \ \ x = e.$$

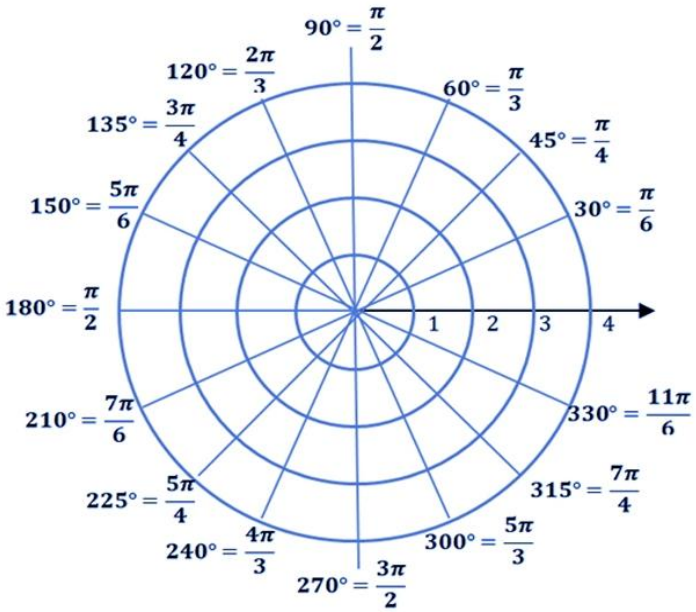
about the $\boldsymbol{y - axis}$. [3 points]

Question IV: **[**2+3=5 points]

A. Find the arc length of the curve with parametric equations [2 points]

$$x = t - \sqrt{2}, \qquad y = \cosh t\,, \qquad 0 \le t \le \ln 2.$$

B. **Sketch** the region inside the graph of the polar equation $r = 2 + 2\cos\theta$ and outside the graph of the curve $r = 2$. Then **find its area**. [3 points]



Good Luck 😊