

Provide a presentation that is both clear and organized. Show all of your work, completely simplify all answers, and provide exact values only. Do not use any table of integrals to evaluate any integrals on this exam.

1. (10 pts) Evaluate $\int \frac{e^x}{1-e^{2x}} \ln \frac{1-e^x}{1+e^x} dx = -\frac{1}{4} \ln^2 \frac{1-e^x}{1+e^x} + C$

2. (15 pts) Evaluate $\int \sin(\ln x^\pi) dx = \frac{x}{1+\pi^2} (\sin(\ln x^\pi) - \pi \cos(\ln x^\pi)) + C$

3. (20 pts) Evaluate $\int \frac{x^4-1}{\sqrt{3-x^2}} dx = \frac{19}{8} \sin^{-1} \frac{x}{\sqrt{3}} - \frac{1}{8} x (2x^2+9) \sqrt{3-x^2} + C$

4. (15 pts) Evaluate $\int \frac{x+1}{x^3+8} dx = \frac{1}{24} \ln \frac{x^2-2x+4}{x^2+4x+4} + \frac{\sqrt{3}}{4} \tan^{-1} \frac{x-1}{\sqrt{3}} + C$

5. (15 pts) Evaluate $\int \frac{1}{2x+\sqrt{x-7}} dx = \frac{1}{2} \ln(2x+\sqrt{x-7}) - \frac{1}{\sqrt{111}} \tan^{-1} \frac{4\sqrt{x-7}+1}{\sqrt{111}} + C$

6. (15 pts) Evaluate $\int \frac{1}{\cos x - 2 \sin x} dx = -\frac{2}{\sqrt{5}} \tan^{-1} \frac{\tan \frac{x}{2} + 2}{\sqrt{5}} + C$

or $\int \frac{1}{\cos x - 2 \sin x} dx = \frac{1}{\sqrt{5}} \ln \frac{\sqrt{5} + 2 + \tan \frac{x}{2}}{\sqrt{5} - 2 - \tan \frac{x}{2}} + C$

7. (15 pts) Set up an integral (but do not evaluate) that would determine the area of the region bounded by the graphs of the following equations. Provide a clear sketch of the graphs of these equations.

$$y = \frac{x}{x-2} \quad \text{and} \quad y = -\frac{1}{2}x + \frac{9}{2}$$

$$A = \int_3^6 \left(-\frac{1}{2}x + \frac{9}{2} - \frac{x}{x-2} \right) dx$$