1. Evaluate $\int_2^3 xe^{x^2}\, dx$.

2. Evaluate $\int \dfrac{9x + 9}{(x - 1)(x^2 + 4x + 13)}\, dx$.

3. Evaluate $\int e^x \sin x \, dx$.

4. Evaluate $\int \dfrac{\cos x \, dx}{(\sin^2 x + 4)^{5/2}}$.

5. Does the following integral converge or diverge? Give your reasons fully and clearly. If the integral converges, find its value.

$$\int_{\pi/4}^{\pi/2} \frac{\sec^2 \theta}{\tan^2 \theta - 1}\, d\theta$$

6. Does the following series converge or diverge? Give your reasons fully and clearly. If the series converges, find its value.

$$\sum_{n=1}^{\infty} e^{-2\pi n}$$

7. Does the following integral converge or diverge? Give your reasons fully and clearly.

$$\int_1^{\infty} \frac{dx}{e^{-x} + \sqrt{x - 1}}$$

8. Does the following series converge or diverge? Give your reasons fully and clearly.

$$\sum_{n=2}^{\infty} \frac{1}{n \ln n}$$