

Instructions: Show all work. Answers without work required to obtain the solution will not receive full credit. Some questions may contain multiple parts: be sure to answer all of them. Give exact answers unless specifically asked to estimate.

1. Integrate.

a. $\int \frac{1}{x^2+1} + \sec x \, dx$

$$\arctan x + \ln|\sec x + \tan x| + C$$

b. $\int 5^x + x^{-5} \, dx$

$$\frac{1}{\ln 5} \cdot 5^x - \frac{1}{4} x^{-4} + C$$

c. $\int \cos^2 t + \frac{\sin \sqrt{t}}{\sqrt{t}} \, dt$

$$\int \frac{1}{2}(1 + \cos 2t) + \frac{\sin \sqrt{t}}{\sqrt{t}} \, dt$$

$$\int \frac{1}{2} + \frac{1}{2} \cos 2t + \frac{\sin \sqrt{t}}{\sqrt{t}} \, dt$$

$$\frac{1}{2}t + \frac{1}{4} \sin 2t + \int 2 \sin u \, du$$

$$\frac{1}{2}t + \frac{1}{4} \sin 2t - 2 \cos \sqrt{t} + C$$

$$\begin{aligned} u &= \sqrt{t} = t^{1/2} \\ \therefore du &= \frac{1}{2} t^{-1/2} = \frac{1}{2\sqrt{t}} \\ 2du &= \frac{1}{\sqrt{t}} \end{aligned}$$