

1.) Use any method to determine the following indefinite integrals (antiderivatives).

a.) $\int \arcsin x \, dx$ b.) $\int \frac{\cos x}{1 + \sin^2 x} \, dx$ c.) $\int \ln x \, dx$ d.) $\int x(\ln x)^2 \, dx$
e.) $\int \frac{(\ln x)^2}{x} \, dx$ f.) $\int \frac{3 + \ln x}{x(4 + \ln x)} \, dx$ g.) $\int \frac{1}{(4x + 3)^3} \, dx$ h.) $\int \frac{x + 1}{(4x + 3)^3} \, dx$
i.) $\int \frac{x + 2}{x^2 + 4x + 13} \, dx$ j.) $\int \frac{x}{x^2 + 4x + 13} \, dx$ k.) $\int \frac{1}{25x^2 + 9} \, dx$
l.) $\int \frac{7x}{25x^2 + 9} \, dx$ m.) $\int \frac{x^2}{x^2 + 1} \, dx$ n.) $\int \frac{x + 5}{2x^2 + 3x + 5} \, dx$ o.) $\int \frac{1 + x^6}{x^5} \, dx$
p.) $\int \frac{x^5}{1 + x^6} \, dx$ q.) $\int \frac{x^2}{1 + x^6} \, dx$ r.) $\int \frac{1 - x}{\sqrt{1 - 4x^2}} \, dx$ s.) $\int (4x + 3)^{\frac{125}{7}} \, dx$

2.) Compute the area of the region bounded by the graphs of $y = xe^x$, $y = 0$, and $x = \ln 4$

3.) Find the following antiderivative two ways, using u-substitution and using integration by parts : $\int x^5(1 + x^3)^4 \, dx$

4.) Find the following antiderivative by using integration by parts twice, then using algebraic manipulation : $\int e^{2x} \sin x \, dx$

5.) Find the average value of $f(x) = x \ln x$ on the interval $[1, e]$.

THE FOLLOWING PROBLEM IS FOR RECREATIONAL PURPOSES ONLY.

6.) Determine the exact value of the following expression :

$$\sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \sqrt{1 + \dots}}}}}$$