

(1) Find the indefinite integrals.

(a) $\int (x^2 + 1)5^{x^3+3x+1} dx$

(b) $\int e^{\cos t+6} \sin t dt$

(c) $\int \frac{e^t}{e^{2t} + 1} dt$

(d) $\int \frac{1}{t^2 + 2t + 10} dt$

(e) $\int \frac{1}{x^2 + 2x} dx$

(2) Find the definite integrals.

(a) $\int_0^1 \frac{x^2}{x+1} dx$ (Hint: divide)

(b) $\int_{-1}^1 \frac{x}{x^2 + 1} dx$

(c) $\int_1^2 \frac{\ln x}{x^2} dx$

(d) $\int_0^{\frac{\pi}{2}} \sin t dt =$

(e) $\int_1^3 \frac{2}{x^3} dx =$

(3) Using upper and lower sums, show that $\frac{5}{6} \leq \ln 3 \leq \frac{3}{2}$.

(4) What does it mean for a function to be integrable on the interval $[0, 1]$? Give an example of a function which is integrable on $[0, 1]$, and one which isn't.

(5) Give a function $G(x)$ such that $\frac{dG}{dx} = \cos x^2$.

(6) Find the average value of the function $f(x) = x^2$ on the interval $[1, 3]$.

(7) Compute $\int_a^1 \frac{1}{x} dx$ where $a > 0$. What is the limit as a goes to 0?

(8) Compute $\int_a^1 \frac{1}{\sqrt{x}} dx$ where $a > 0$. What is the limit as a goes to 0? How can you interpret that?