

1. Evaluate the following indefinite integrals.

(a) $\int (3x - 2)^7 dx$

(b) $\int 6x^2(2x^3 + 3)^5 dx$

(c) $\int 5 \sin^3 z \cos z dz$

(d) $\int 2t^2 \cos(4t^3) dt$

(e) $\int \frac{5x^4}{(x^5 + 1)^3} dx$

(f) $\int \frac{(1 + \sqrt{x})^{\frac{1}{3}}}{\sqrt{x}} dx$

$$(g) \int \theta \sqrt[3]{1 - \theta^2} d\theta$$

$$(h) \int \frac{\sec z \tan z}{\sqrt{\sec z}} dz$$

$$(i) \int t^3 \sqrt{t^2 + 1} dt$$

$$(j) \int \frac{1}{\varphi^2} \sin\left(\frac{1}{\varphi}\right) \cos\left(\frac{1}{\varphi}\right) d\varphi$$

$$(k) \int \tan^2 x \sec^2 x dx$$

$$(l) \int \sqrt{\frac{x^4}{x^3 - 1}} dx$$

2. Find solutions to the following initial value problems.

(a) $\frac{ds}{dt} = 12t(3t^2 - 1)^3, s(1) = 3$

(b) $\frac{ds}{dt} = 8 \sin^2 \left(t + \frac{\pi}{12} \right), s(0) = 8$

3. Use substitution to evaluate each of the following definite integrals.

(a) $\int_1^2 x^2(4x^3 - 1)^5 dx$

(b) $\int_0^1 3t\sqrt{4 - 3t^2} dt$

(c) $\int_{\frac{\pi}{6}}^{\frac{\pi}{2}} \sin(x) \cos^4(x) dx$

(d) $\int_0^1 \frac{5z}{(4 + z^2)^2} dz$