

Calculus I

Homework

Integral substitution rule

1. Evaluate the indefinite integral. The answer key has not been proofread, use with caution.

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| (a) $\int (1 + 3x)^9 dx.$ | (j) $\int x(2x + 5)^{2014} dx.$ | (s) $\int \frac{\sin \sqrt{t}}{\sqrt{t}} dt.$ |
| (b) $\int (\sqrt{2x + 1}) dx.$ | (k) $\int x^3 (\sqrt{x^2 + 1}) dx.$ | (t) $\int \sec^2 t \tan^3 t dt.$ |
| (c) $\int (3x + 2)^{2.4} dx.$ | (l) $\int \sqrt{x} \sin \left(2 + x^{\frac{3}{2}}\right) dx.$ | (u) $\int \cos^4 t \sin t dt.$ |
| (d) $\int (x - 1) \sqrt{2x - x^2} dx.$ | (m) $\int \frac{\cos \left(\frac{\pi}{x}\right)}{x^2} dx.$ | (v) $\int \frac{dt}{\cos^2 t \sqrt{1 + \tan t}}.$ |
| (e) $\int x \sqrt{1 - x^2} dx.$ | (n) $\int \csc^2(2t) dt.$ | (w) $\int \sqrt{\cot t} \csc^2 t dt.$ |
| (f) $\int \frac{1 + x^2}{\sqrt{3x + x^3}} dx.$ | (o) $\int \sec(5t) \tan(5t) dt.$ | (x) $\int \sin t \sec^2(\cos t) dt.$ |
| (g) $\int (x^2 + 1)(x^3 + 3x)^5 dx.$ | (p) $\int \frac{\cos t}{\sin t} dt.$ | (y) $\int \sec^3 t \tan t dt.$ |
| (h) $\int \frac{x^2}{\sqrt[3]{1 + x^3}} dx.$ | (q) $\int \tan t dt.$ | (z) $\int t \sin(t^2) dt.$ |
| (i) $\int x^2 (\sqrt{1 + x}) dx.$ | (r) $\int \cot(2t) dt.$ | |

To solve problem 2.u please use the formula $\int \frac{1}{1+x^2} dx = \arctan x + C$. Here, $\arctan x$ is the arctangent function - the inverse function to $\tan y$.

2. Evaluate the integral. The answer key has not been proofread, use with caution.

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| (a) $\int \frac{dx}{3x + 5}.$ | (h) $\int e^{\cot x} \csc^2 x dx.$ | (o) $\int \frac{\cos x}{\sin x} dx$ |
| (b) $\int \frac{dx}{2 - 3x}.$ | (i) $\int \frac{x}{1 + x^2} dx.$ | (p) $\int \cot x dx.$ |
| (c) $\int e^x \cos(e^x) dx.$ | (j) $\int \frac{x}{2 + 3x^2} dx.$ | (q) $\int \cot\left(\frac{x}{2}\right) dx$ |
| (d) $\int \frac{(\ln x)^3}{x} dx.$ | (k) $\int \frac{x}{\sqrt{1 - x^2}} dx.$ | (r) $\int \tan(2x) dx.$ |
| (e) $\int e^x (\sqrt{e^x + 1}) dx$ | (l) $\int \frac{\cos(\ln x)}{x} dx.$ | (s) $\int \frac{x^4 + 3x}{x^2} dx$ |
| (f) $\int e^x \sqrt{1 - e^x} dx.$ | (m) $\int \frac{\sin(\ln x)}{x} dx.$ | (t) $\int x^2 e^{x^3} dx$ |
| (g) $\int e^{\sin t} \cos t dt.$ | (n) $\int \frac{\sin(2x)}{2 + \cos^2 x} dx.$ | (u) $\int \frac{\arctan x}{1 + x^2} dx.$ |

3. Evaluate the definite integral. The answer key has not been proofread, use with caution.

- (a) $\int_e^{e^3} \frac{dx}{x \sqrt[3]{\ln x}}.$

$$(b) \int_0^1 x e^{-x^2} dx.$$

$$(c) \int_0^1 \frac{e^x + 1}{e^x + x} dx.$$

$$(d) \int_1^2 \frac{x}{2x^2 + 1} dx.$$

$$(e) \int_{-3}^{-2} \frac{x}{1 - x^2} dx.$$

$$(f) \int_{-3}^{-2} \frac{3x}{2 - x^2} dx.$$

$$(g) \int_0^{\frac{1}{4}} \frac{x}{\sqrt{1 - 3x^2}} dx.$$