Trigonometric Integration Formulas

$$\int \sin(u)\,du = -\cos(u) + K \qquad \int \sec(u)\tan(u)\,du = \sec(u) + K$$

$$\int \cos(u)\,du = \sin(u) + K \qquad \int \csc^2(u)\,du = -\cot(u) + K$$

$$\int \sec^2(u)\,du = \tan(u) + K \qquad \int \csc(u)\cot(u)\,du = -\csc(u) + K$$

Compute the following indefinite integrals. An answer key is available on-line.

1 $\displaystyle\int x^2 \sin(x^3+1)\,dx$

2 $\displaystyle\int \frac{\cos(1/x)}{x^2}\,dx$

3 $\displaystyle\int \cot(t)\,dt$

4 $\displaystyle\int \sin^2(x)\cos(x)\,dx$

5 $\displaystyle\int \sin^2(x)\cos^3(x)\,dx$

6 $\displaystyle\int x^5 \cos(x^3)\,dx$

7 $\displaystyle\int \frac{\cos(2x)}{\sqrt[3]{10+5\sin(2x)}}\,dx$

8 $\displaystyle\int e^{3x}\sin(e^{3x})\,dx$

9 $\displaystyle\int e^{\sin(4x)}\cos(4x)\,dx$

10 Verify the formula

$$\int \sec(x)\,dx = \ln\left(|\sec(x)+\tan(x)|\right) + K$$

by differentiating the right-hand side.

11 (Optional)

(a) Verify the general formula

$$\int e^{ax}\cos(bx)\,dx = \frac{1}{a^2+b^2}e^{ax}\left(a\cos(bx)+b\sin(bx)\right) + K$$

by integrating by parts twice.

(b) Verify the formula

$$\int e^{ax}\sin(bx)\,dx = \frac{1}{a^2+b^2}e^{ax}\left(a\sin(bx)-b\cos(bx)\right) + K$$

by integrating by parts once and using the formula in part (a).

12 Use the formulas from the previous problem (rather than integrating directly) to compute the following integrals.

(a) $\displaystyle\int e^{3x}\cos(4x)\,dx$ (b) $\displaystyle\int e^{-x}\sin(x)\,dx$ (c) $\displaystyle\int e^{7x}\cos(x)\,dx$