

Homework Key for Section 1

1. Evaluate the following:

(a) $\int x^2 \ln x \, dx$ let $u = \ln x$ and $dv = x^2 \, dx$

$$\frac{1}{3}x^3 \ln x - \frac{1}{9}x^3 + C$$

(b) $\int x \cos 5x \, dx$

$$\frac{x}{5} \sin 5x + \frac{1}{25} \cos 5x + C$$

(c) $\int x e^{x/2} \, dx$

$$2(x - 2)e^{x/2} + C$$

(d) $\int x^2 \sin \pi x \, dx$

$$-\frac{x^2}{\pi} \cos \pi x + \frac{2x}{\pi^2} \sin \pi x + \frac{2}{\pi^3} \cos \pi x + C$$

(e) $\int \sin^{-1} x \, dx$

$$x \sin^{-1} x + \sqrt{1 - x^2} + C$$

(f) $\int e^{2\theta} \sin 3\theta \, d\theta$

$$\frac{e^{2\theta}}{13} (2 \sin 3\theta - 3 \cos 3\theta) + C$$

(g) $\int \cos x \ln(\sin x) \, dx$

$$\sin x (\ln \sin x - 1) + C$$

Homework Key for Section 2

1. Evaluate the following:

$$(a) \int \sin^3 x \cos^2 x dx$$

$$\frac{1}{5}\cos^5 x - \frac{1}{3}\cos^3 x + C$$

$$(b) \int \sin^6 x \cos^3 x dx$$

$$\frac{\sin^7 x}{7} - \frac{\sin^9 x}{9} + C$$

$$(c) \int_0^{\pi/2} \cos^2 \theta d\theta$$

$$\frac{\pi}{4}$$

$$(d) \int (1 + \cos \theta)^2 d\theta$$

$$\frac{3}{2}\theta + 2\sin \theta + \frac{1}{4}\sin 2\theta + C$$

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

$$\frac{\tan^2 x}{2} + C$$

$$(f) \int \tan^2 x dx$$

$$\tan x - x + C$$

$$(g) \int \tan^3 x \sec x dx$$

$$\frac{\sec^3 x}{3} - \sec x + C$$

Homework Key for Section 3

1. Evaluate the following:

$$(a) \int \frac{1}{x^2 \sqrt{x^2 - 9}} dx \quad x = 3 \sec \theta$$
$$\frac{\sqrt{x^2 - 9}}{9x} + C$$

$$(b) \int \frac{x^3}{\sqrt{x^2 + 9}} dx \quad x = 3 \tan \theta$$
$$\frac{1}{3}(x^2 - 18)(\sqrt{x^2 + 9}) + C$$

$$(c) \int_{\sqrt{2}}^2 \frac{1}{x^3 \sqrt{x^2 - 1}} dx$$
$$\frac{\pi}{24} + \frac{\sqrt{3}}{8} - \frac{1}{4}$$

$$(d) \int \frac{1}{x^2 \sqrt{25 - x^2}} dx$$
$$-\frac{\sqrt{25 - x^2}}{25x} + C$$

$$(e) \int \frac{dx}{\sqrt{x^2 + 16}}$$
$$\ln(\sqrt{x^2 + 16} + x) + C$$

$$(f) \int \sqrt{1 - 4x^2} dx$$
$$\frac{1}{4} \sin^{-1}(2x) + \frac{x}{2} \sqrt{1 - 4x^2} + C$$

$$(g) \int \frac{x}{\sqrt{x^2 - 7}} dx$$
$$\sqrt{x^2 - 7} + C$$

$$(h) \int \sqrt{5 + 4x - x^2} dx$$
$$\frac{9}{2} \sin^{-1} \left(\frac{x - 2}{3} \right) + \frac{x - 2}{2} \sqrt{5 + 4x - x^2} + C$$

Homework Key for Section 4

1. Evaluate the following:

$$(a) \int \frac{x}{x-6} dx \qquad x + 6 \ln |x-6| + C$$

$$(b) \int \frac{x-9}{(x+5)(x-2)} dx \qquad 2 \ln |x+5| - \ln |x-2| + C$$

$$(c) \int_2^3 \frac{1}{x^2-1} dx \qquad \frac{1}{2} \ln \frac{3}{2}$$

$$(d) \int \frac{1}{(x+5)^2(x-1)} dx \qquad -\frac{1}{36} \ln |x+5| + \frac{1}{6(x+5)} + \frac{1}{36} \ln |x-1| + C$$

$$(e) \int \frac{5x^2 + 3x - 2}{x^3 + 2x^2} dx \qquad 2 \ln |x| + \frac{1}{x} + 3 \ln |x+2| + C$$

2. Make a substitution to obtain a rational function and then evaluate the following:

$$(a) \int \frac{1}{x\sqrt{x+1}} dx \qquad \ln \left| \frac{\sqrt{x+1}-1}{\sqrt{x+1}+1} \right| + C$$

$$(b) \int \frac{x^3}{\sqrt[3]{x^2+1}} dx \qquad \frac{3}{10}(x^2+1)^{5/3} - \frac{3}{4}(x^2+1)^{2/3} + C$$

Homework Key for Section 5

1. Evaluate the following:

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

$$\frac{1}{2} \sin^{-1} \left(\frac{x^2}{\sqrt{3}} \right) + C$$

$$(b) \int \frac{dx}{(1-x^2)^{3/2}}$$

$$\frac{x}{\sqrt{1-x^2}} + C$$

$$(c) \int e^{x+e^x} dx$$

$$e^{e^x} + C$$

$$(d) \int_0^1 (1+\sqrt{x})^8 dx$$

$$\frac{4097}{45}$$

$$(e) \int \frac{3x^2-2}{x^2-2x-8} dx$$

$$3x + \frac{23}{3} \ln |x-4| - \frac{5}{3} \ln |x+2| + C$$

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

$$\sin^{-1} x - \sqrt{1-x^2} + C$$

$$(g) \int \sqrt{3-2x-x^2} dx$$

$$2 \sin^{-1} \left(\frac{x+1}{2} \right) + \frac{x+1}{2} \sqrt{3-2x-x^2} + C$$

$$(h) \int_0^{\pi/4} \cos^2 \theta \tan^2 \theta d\theta$$

$$\frac{4\pi-8}{32}$$

$$(i) \int e^x \sqrt{1+e^x} dx$$

$$\frac{2}{3} (1+e^x)^{3/2} + C$$