Section 8.3 Notes

December 7, 2019

8.3.4

$$\int \sin^4(2x)\cos(2x)\,dx$$
$$u = \sin(2x) \quad du = 2\cos(2x)dx$$
$$= \frac{1}{2}\int u^4\,du$$
$$= \frac{1}{10}u^5 + C$$
$$= \frac{1}{10}\sin^5(2x) + C$$

8.3.5

$$\int \sin^3(x)\,dx$$
$$= \int (1 - \cos^2(x))\sin(x)\,dx$$
$$u = \cos(x) \quad du = -\sin(x)dx$$
$$= -\int (1 - u^2)\,du$$
$$= \frac{1}{3}u^3 - u + C$$
$$= \frac{1}{3}\cos^3(x) - \cos(x) + C$$

8.3.27 (Most of the Work)

$$\int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\,dx}{\sqrt{1-\cos(x)}}$$

$$= \int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\sqrt{1+\cos(x)}\,dx}{\sqrt{1-\cos(x)}\sqrt{1+\cos(x)}}$$

$$= \int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\sqrt{1+\cos(x)}\,dx}{\sqrt{(1-\cos(x))(1+\cos(x))}}$$

$$= \int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\sqrt{1+\cos(x)}\,dx}{\sqrt{1-\cos^2(x)}}$$

$$= \int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\sqrt{1+\cos(x)}\,dx}{\sqrt{\sin^2(x)}}$$

$$= \int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\sqrt{1+\cos(x)}\,dx}{|\sin(x)|}$$

$$= \int_{\pi/3}^{\pi/2} \frac{\sin^2(x)\sqrt{1+\cos(x)}\,dx}{\sin(x)} \quad \text{(Because } \sin(x) > 0 \text{ for } \pi/3 \leq x \leq \pi/2\text{)}$$

$$= \int_{\pi/3}^{\pi/2} \sin(x)\sqrt{1+\cos(x)}\,dx$$

$$u = 1 + \cos(x) \quad du = -\sin(x)dx$$

$$u(\pi/3) = \frac{3}{2} \quad u(\pi/2) = 1$$

$$= -\int_{3/2}^{1} \sqrt{u}\,du$$

...

$$= -\frac{2}{3} + \sqrt{\frac{3}{2}}$$