University of Strathclyde, Department of Mathematics and Statistics

MM102 Applications of Calculus
Exercises for Week 2

1. Evaluate the following integrals.

   (a) $\displaystyle\int \cos^2 x \cdot \sin^7 x \, \mathrm{d}x$

   (b) $\displaystyle\int \cos^7 x \, \mathrm{d}x$

   (c) $\displaystyle\int \sin^4 x \cdot \cos^4 x \, \mathrm{d}x$

   (d) $\displaystyle\int \cos^4 x \, \mathrm{d}x$

   (e) $\displaystyle\int \cos^3 x \cdot \sin^5 x \, \mathrm{d}x$

   (f) $\displaystyle\int_0^{\pi/2} \sin^2 x \cdot \cos^5 x \, \mathrm{d}x$

   (g) $\displaystyle\int \sin^4 x \, \mathrm{d}x$

   (h) $\displaystyle\int_0^1 \sin^2(\pi x) \, \mathrm{d}x$

   (i) $\displaystyle\int_0^1 \sin^3\Big(\frac{\pi x}{2}\Big) \mathrm{d}x$

   (j) $\displaystyle\int \sin^2 x \cdot \cos^2 x \, \mathrm{d}x$

2. Evaluate the following integrals.

   (a) $\displaystyle\int \cos(4x) \cdot \cos x \, \mathrm{d}x$

   (b) $\displaystyle\int \sin(7x) \cdot \cos(2x) \, \mathrm{d}x$

   (c) $\displaystyle\int_0^{\pi/2} \sin(3x) \cdot \sin(2x) \, \mathrm{d}x$

3. Use the substitution $t = \tan \frac{x}{2}$ to evaluate the following integrals.

   (a) $\displaystyle\int \frac{1}{1 + \sin x} \, \mathrm{d}x$

   (b) $\displaystyle\int \frac{1}{1 - 3\cos x} \, \mathrm{d}x$

   (c) $\displaystyle\int \frac{1}{\sin^2 x \cdot (1 + \cos x)} \, \mathrm{d}x$

4. Evaluate the following integrals.

   (a) $\displaystyle\int e^{2x} \sin(2x) \, \mathrm{d}x$

   (b) $\displaystyle\int e^{3x} \sin x \, \mathrm{d}x$

   (c) $\displaystyle\int e^{x} \cos x \, \mathrm{d}x$

   (d) $\displaystyle\int e^{x} \cos(2x) \, \mathrm{d}x$

5. Evaluate the following integrals.

(a) $\displaystyle\int \frac{3x+2}{\sqrt{x-3}}\,\mathrm{d}x$

(b) $\displaystyle\int \frac{\sqrt{2x-1}}{x}\,\mathrm{d}x$

(c) $\displaystyle\int (x^2+2)\sqrt{x+1}\,\mathrm{d}x$

(d) $\displaystyle\int_1^5 \frac{x-1}{\sqrt{2x-1}}\,\mathrm{d}x$

6. Evaluate the following integrals.

(a) $\displaystyle\int \frac{1}{\sqrt{x^2-1}}\,\mathrm{d}x$

(b) $\displaystyle\int_0^3 x^2\sqrt{9-x^2}\,\mathrm{d}x$

(c) $\displaystyle\int \frac{1}{\sqrt{4x^2+4x+10}}\,\mathrm{d}x$

(d) $\displaystyle\int \frac{1}{\sqrt{x^2+6x+5}}\,\mathrm{d}x$

(e) $\displaystyle\int_2^5 \frac{x+4}{\sqrt{5+4x-x^2}}\,\mathrm{d}x$

(f) $\displaystyle\int \frac{1}{\sqrt{4x^2-4x}}\,\mathrm{d}x$

(g) $\displaystyle\int_{-\frac{1}{2}}^{\frac{1}{2}} \frac{x^2}{\sqrt{3-4x-4x^2}}\,\mathrm{d}x$

(h) $\displaystyle\int x^3\sqrt{1-x^2}\,\mathrm{d}x$

(i) $\displaystyle\int_1^3 \frac{x}{\sqrt{x^2-2x+5}}\,\mathrm{d}x$

(j) $\displaystyle\int_0^2 x^2\sqrt{4-x^2}\,\mathrm{d}x$