MEMORIAL UNIVERSITY OF NEWFOUNDLAND

DEPARTMENT OF MATHEMATICS AND STATISTICS

ASSIGNMENT 1 **MATHEMATICS 1001** WINTER 2025

SOLUTIONS

[3] 1. (a) We begin by simplifying the integrand:

$$\int \frac{x^3 + 5\sqrt{x} - 4}{\sqrt{x}}\,dx = \int (x^{\frac{5}{2}} + 5 - 4x^{-\frac{1}{2}})\,dx$$
$$= \frac{x^{\frac{7}{2}}}{\frac{7}{2}} + 5x - 4\left(\frac{x^{\frac{1}{2}}}{\frac{1}{2}}\right) + C$$
$$= \frac{2}{7}x^{\frac{7}{2}} + 5x - 8\sqrt{x} + C.$$

[4] (b) We first expand and simplify:

$$\int \frac{(4x-5)^2}{x}\,dx = \int \frac{16x^2 - 40x + 25}{x}\,dx$$
$$= \int \left(16x - 40 + \frac{25}{x}\right)\,dx$$
$$= 16\left(\frac{x^2}{2}\right) - 40x + 25\ln|x| + C$$
$$= 8x^2 - 40x + 25\ln|x| + C.$$

[2] (c) Recall that

$$\int \frac{1}{h^{100}}\,dh = \int h^{-100}\,dh = \frac{h^{-99}}{-99} + C = -\frac{1}{99h^{99}} + C.$$

Thus

$$\int \frac{1}{(2-h)^{100}}\,dh = (-1)\left(-\frac{1}{99(2-h)^{99}}\right) + C = \frac{1}{99(2-h)^{99}} + C.$$

[2] (d) Note that

$$\int \sec(x)\tan(x)\,dx = \sec(x) + C$$

so

$$\int \sec(3x-8)\tan(3x-8)\,dx = \frac{\sec(3x-8)}{3} + C = \frac{1}{3}\sec(3x-8) + C.$$

[3] (e) We first simplify the integrand:

$$\int \frac{e^x}{e^{8x}}\,dx = \int e^{-7x}\,dx = -\frac{1}{7}e^{-7x} + C.$$

[3] (f) We begin by rewriting the integrand:

$$\begin{aligned}\int \tan(t)\cos(t)\csc(t)\,dt &= \int \frac{\sin(t)}{\cos(t)} \cdot \cos(t) \cdot \frac{1}{\sin(t)}\,dt \\ &= \int dt \\ &= t + C.\end{aligned}$$

[3] (g) We can write

$$\begin{aligned}\int \frac{1-\cos^2(7x)}{\sin(7x)}\,dx &= \int \frac{\sin^2(7x)}{\sin(7x)}\,dx \\ &= \int \sin(7x)\,dx \\ &= -\frac{1}{7}\cos(7x) + C.\end{aligned}$$