MATH 152 Assignment 3, Fall 2019.

Michael Monagan

Webassign exercises.

7.3 Exercises 4, 12, 15.
Use the integration tables in the textbook – see REFERENCE pages 6 and 7.

7.4 Exerises 7, 10, 19, 26, 31.

7.5 Exercises 1, 3, 8, 13, 27.

7.7 Exercise 14, 30.

7.8 Exercises 1, 9, 11, 20.

Written questions

1 Section 7.3 exercises 4 and 12 from the textbook. Use a trigonometric substitution.

2 Calculate $\int_0^1 2x\sqrt{1-x^4}\,dx$. First use the substitution $u = x^2$. Then use a trigonometric substitution.

3 Calculate the partial fraction decomposition of

$$\frac{x^4}{x^4-1} \quad \text{and} \quad \frac{x^3+4x+3}{x^4+5x^2+4}.$$

To factor the denominators use the substitution $x^2 = u$ first.

4 Section 7.4 exercise 60 and Section 7.5 exercise 36. Use the tan half angle subsitution $t = \tan\frac{x}{2}$. See Section 7.4 exercise 59. Use $\tan\frac{x}{2} = (1-\cos x)/\sin x$ to express the answer in terms of $\sin x$ and $\cos x$.

5 Section 7.5 exercises 14 and 40. For exercise 14, use integration by parts first to get rid of the logarithm.

6 Section 7.7 Exercise 21. To save some work, use $n = 6$ not $n = 10$.
You should get $T_6 = 1.954097, M_6 = 2.023030$ and $S_6 = 2.000863$.

7 There is a relation between the Trapezoidal rule T_n, the Midpoint rule M_n and Simpson's rule S_n, namely,

$$\frac{1}{3}T_n + \frac{2}{3}M_n = S_{2n}.$$

Prove this for $n = 2$.

8 Evaluate the improper integral $\int_1^\infty \frac{dx}{x^2+x}$. Note, it must be convergent because $\frac{1}{x^2+x} < \frac{1}{x^2}$ for $x \geq 1$ and $\int_1^\infty \frac{dx}{x^2} = 1$.

9 Evaluate the improper integral $\int_0^1 t\ln t\,dt$.