

## EEN 271 Numerical Engineering Methods Spring 2019 HW # 5

**Q1.** Problem 21.3 (page 630)

Evaluate the following integral:

$$\int_{-2}^4 (1 - x - 4x^3 + 2x^5) dx$$

- (a) analytically
- (b) single application of the trapezoidal rule
- (c) composite trapezoidal rule, with  $n = 2$  and 4
- (d) single application of Simpson's 1/3 rule; (e) Simpson's 3/8 rule
- (f) determine the percent relative error based on (a) for (b), (c), and (d).

**Q2.** Problem 21.10 (page 630)

Evaluate the integral of the following tabular data with

- (a) the trapezoidal rule
- (b) Simpson's rules:

$x$	0	0.1	0.2	0.3	0.4	0.5
$f(x)$	1	8	4	3.5	5	1

**Q3.** Problem 23.1 (page 670)

Compute **forward** and **backward** difference approximations of  $O(h)$  and  $O(h^2)$ , and **central** difference approximations of  $O(h^3)$  and  $O(h^4)$  for the first derivative of  $y = \cos x$  at  $x = \pi/4$  using a value of  $h = \pi/12$ . Estimate the true percent relative error  $\varepsilon_t$  for each approximation.

**Q4.** Example 23.5 (page 666)

Resolve it completely and provide your MATLAB code and results including figures and data.