

# Computational Mathematics/Information Technology

## Solutions to Worksheet 5 Polynomial and Spline Fitting

1. For Problem 1 on Worksheet 5 write down the following:

(a)  $p(x) = -1.533x + 40.895x^2 - 203.09x^3 + 332.542x^4 - 170.694x^5$  [1 mark]

(b)  $\int_0^{0.7} p(x) dx = -0.05942$  [1 mark]

(c)  $p(0.25) = 0.1317$        $p(1.0) = -1.8815$  [2 marks]

2. For Problem 3 on Worksheet 5 write out the complete linear spline  $S(x)$  with its intervals of definition:

$$S(x) = \begin{cases} S_0(x) = 6 - 1.37909x & x \in [0, 1] & [1mark] \\ S_1(x) = 4.62091 - 2.86935(x - 1) = 7.4903 - 2.8694x & x \in [1, 2] & [1mark] \\ S_2(x) = 1.75156 - 1.72154(x - 2) = 5.1946 - 1.7215x & x \in [2, 3] & [1mark] \\ S_3(x) = 0.03002 + 1.00905(x - 3) = 1.0091x - 2.9971 & x \in [3, 4] & [1mark] \end{cases}$$

*Note for markers: 1 mark for each component, including the range; no need to simplify for the mark*

3. For Problem 5 on Worksheet 5:

(a)  $|f(0.5) - S(0.5)| = 0.3223$  [1 mark]

(b)  $|f(1.5) - S(1.5)| = 0.0260$  [1 mark]

*Although not specifically asked for I think students should show at least three decimal places in the above work. If they consistently show 2 decimal places knock off 1 mark, and one decimal place knock off 2 marks.*