Introduction to Numerical Analysis HW4

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1 LEGENDRE POLYNOMIALS

1.

2.

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2 INTERPOLATION

$f(2)$ can be determined using the Lagrange interpolation scheme. As the lagrange interpolation polynomial can be written as below, and $n = 8$ in this case.

$$f(x) = \sum_{i=1}^{n} f(x_i) l_i(x) \tag{2.1}$$

$l_i(x)$ are the base functions that can be written as below.

$$l_i(x) = \frac{(x - x_1)(x - x_2)...(x - x_{i-1})(x - x_{i+1})...(x - x_{n-1})(x - x_n)}{(x_i - x_1)(x_i - x_2)...(x_i - x_{i-1})(x_i - x_{i+1})...(x_i - x_{n-1})(x_i - x_n)} \tag{2.2}$$

$l_i(2)$ are calculated accordingly as below.

$$l_1(2) = -0.0006 \qquad l_2(2) = 0.1224 \qquad l_3(2) = -0.5600 \qquad l_4(2) = 1.0606$$
$$l_5(2) = 0.4167 \qquad l_6(2) = -0.0400 \qquad l_7(2) = 0.0012 \qquad l_8(2) = -0.0003$$

Thus, $f(2)$ is calculated according to (2.1) as 11.0.

3 NEWTON'S FORM OF INTERPOLATION POLYNOMIAL

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