

Assignment 5

Interpolation, Differentiation & Integration

1. Table 1 lists the birth rate in Malaysia from 1975 to 2015.

Table 1

Year	1975	1985	1995	2005	2015
Birth rate	30.7	31.5	26.1	18.2	16.7

Use appropriate Newton's interpolation to approximate the birth rate in 1980 and 2010.

2. Table 2 lists the Index of Industrial Production (2005=100), 1970 – 2010 in Malaysia.

Table 2

Year	1970	1975	1980	1985	1990	1995	2000	2005	2010
Total Index	6	8.6	13.6	18.7	31.6	53.2	78.8	100	107.1

- a) Determine the appropriate linear polynomial expression, $p(x) = a_0 + a_1x$
- b) Estimate the total index in 1979.

3. Given the data (x, y) in Table 3.

Table 3

x	1.5	2.5	4	5	6.5
y	0.455	1.615	3.750	5.333	7.857

Use Lagrange interpolating polynomials to estimate $y(3.0)$.

4. Given, $f(x) = 2x^3 + x^2 - 4$, estimate $f'(2.5)$ and $f''(2.5)$ using:
- a) Central three-point and five-point formulas with $h=0.5$.
 - b) Find the exact value of $f'(2.5)$ and $f''(2.5)$.
 - c) Calculate the error for each estimation in (a).

5. Approximate, $\int_0^3 \frac{2}{1+5x^2} dx$ using:

- a) Trapezoidal rule with $N=6$.
- b) Simpson's 1/3 formula with $N=6$.
- c) Simpson's 3/8 formula with $h=0.25$.
- d) Romberg until R_{33}