

## Chapter #4 Interpolation and approximation (B)

1. For the given functions  $f(x)$ , let  $x_0 = 0$ ,  $x_1 = 0.6$ , and  $x_2 = 0.9$ . Construct interpolation polynomials of degree at most one and at most two to approximate  $f(0.45)$ , and find the absolute error.

  - a.  $f(x) = \cos x$
  - b.  $f(x) = \sqrt{1+x}$
  - c.  $f(x) = \ln(x+1)$
  - d.  $f(x) = \tan x$

2. Use appropriate Lagrange interpolating polynomials of degrees one, two, and three to approximate each of the following:

  - a.  $f(8.4)$  if  $f(8.1) = 16.94410$ ,  $f(8.3) = 17.56492$ ,  $f(8.6) = 18.50515$ ,  $f(8.7) = 18.82091$
  - b.  $f\left(-\frac{1}{3}\right)$  if  $f(-0.75) = -0.07181250$ ,  $f(-0.5) = -0.02475000$ ,  $f(-0.25) = 0.33493750$ ,  $f(0) = 1.10100000$
  - c.  $f(0.25)$  if  $f(0.1) = 0.62049958$ ,  $f(0.2) = -0.28398668$ ,  $f(0.3) = 0.00660095$ ,  $f(0.4) = 0.24842440$
  - d.  $f(0.9)$  if  $f(0.6) = -0.17694460$ ,  $f(0.7) = 0.01375227$ ,  $f(0.8) = 0.22363362$ ,  $f(1.0) = 0.65809197$

$$f(x) = x \sin x, \quad a = 0, \quad n = 4, \quad -1 \leq x \leq 1$$

- (i) Approximate  $f$  by a Taylor polynomial with degree  $n$  at the number  $a$ .
  - (ii) Use Taylor's Inequality to estimate the accuracy of the approximation  $f(x) \approx T_n(x)$  when  $x$  lies in the given interval.
  - (iii) Evaluate  $f$  and these polynomials at  $x = 0.9$ .