Review from Last Class

- Lagrange Interpolation and Newton’s Divided Difference
- Fundamental Theorem of Polynomial Interpolation
Given \((x_1, y_1), (x_2, y_2), \ldots, (x_n, y_n)\) we find an interpolating polynomial \(P(x)\). The difference between the actual function \(f(x)\) and our \(P(x)\) at \(x\) is known as the interpolation error at \(x\)

\[ f(x) - P(x) = \text{interpolation error} \]
Theorem: Interpolation Error Theorem

\[ f(x) - P(x) = \frac{(x - x_1)(x - x_2) \ldots (x - x_n)}{n!} f^{(n)}(c) \]

where \( c \) is between smallest and largest of \( x, x_1, \ldots, x_n \)
Example: Examine interpolation error of $\sin(x)$ on $[0, \frac{\pi}{2}]$.

Example: Find an upper bound for the interpolation error on $[0, 1]$ when using a degree 4 polynomial to approximate $e^x$. 
Examples

Example 1: p 156, Exercise 2

Example 2: p 156, Exercise 4
Interpolate data points from the function $f(x) = \frac{1}{1+12x^2}$
Homework

- Read Section 3.2
- Exercises
  - 3.2 1, 3, 5
- Project 4