HW3

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Math 104A Homework 3
Rad Mallari 8360828

[1]:
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from IPython.display import Latex
Latex('''
$$p_{n}(x)=\sum_{j=0}^{n}f(x_{j})(l_{j}(x))$$

We can look for our $l_{j}(x)$ which are given by
$$l_{i}(x)=\prod_{j=0,\\text{ }j \\neq 1}^{n}\\frac{x-x_{j}}{x_{i}-x_{j}}$$
So for each $i=2$ we have
$$l_{0}(x)=\\frac{(x-x_{1})(x-x_{2})}{(x_{0}-x_{1})(x_{0}-x_{2})}=\\frac{x(x-1)}{6}$$
$$l_{1}(x)=\\frac{(x-x_{0})(x-x_{2})}{(x_{1}-x_{0})(x_{1}-x_{2})}=\\frac{-x^{2}+x-2}{2}$$
$$l_{2}(x)=\\frac{(x-x_{0})(x-x_{1})}{(x_{2}-x_{0})(x_{2}-x_{1})}=\\frac{x(x+2)}{3}$$

And we get the polynomial
$$p_{2}(x)=\\frac{-5x^{2}-7x+6}{6}$$

Approximating $f(-1)$ gives us
$$p_{2}(-1)=\\frac{-5(1)^{2}-7(-1)+6}{6}=\\frac{-5+7+6}{6}=\\frac{2}{3}$$
''')
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[1]:

$$p_n(x) = \sum_{j=0}^{n} f(x_j)(l_j(x))$$

We can look for our $l_j(x)$ which are given by

$$l_i(x) = \prod_{j=0,\, j\neq 1}^{n} \frac{x - x_j}{x_i - x_j}$$

So for each $i = 2$ we have

$$l_0(x) = \frac{(x-x_1)(x-x_2)}{(x_0-x_1)(x_0-x_2)} = \frac{x(x-1)}{6}$$

$$l_1(x) = \frac{(x-x_0)(x-x_2)}{(x_1-x_0)(x_1-x_2)} = \frac{-x^2+x-2}{2}$$

$$l_2(x) = \frac{(x-x_0)(x-x_1)}{(x_2-x_0)(x_2-x_1)} = \frac{x(x+2)}{3}$$

And we get the polynomial

$$p_2(x) = \frac{-5x^2 - 7x + 6}{6}$$

Approximating $f(-1)$ gives us

$$p_2(-1) = \frac{-5(1)^2 - 7(-1) + 6}{6} = \frac{-5 + 7 + 6}{6} = \frac{2}{3}$$

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