**Appendix**

**Matlab Code**

% return the value of lagrange function at x0. Given a series of points(x, y)

function [ p ] = LagrangeFunction( x0, x, y)

for k = 1:size(x0, 2)

p(k) = 0;

for i = 1:size(y, 2)

temp = 1;

for j = 1:size(x, 2)

if i ~= j

temp = temp \* (x0(k) - x(j)) / (x(i) - x(j));

end;

end;

p(k) = p(k) + y(i) \* temp;

end

end

end

% Lagrange Interpolation

x = [-5:5];

gx = 1 ./ ( 1 + x.^2);

gxp = -2\*x ./ (1 + x.^2).^2;

px = LagrangeFunction(x ,x, gx);

dx = 0.001;

for i=1:size(x,2)

xp(2\*i - 1) = x(i) - dx;

xp(2\*i) = x(i) + dx;

end

pxp = LagrangeFunction(xp, x, gx);

for i=1:size(x, 2)

pp(i) = (pxp(2\*i) - pxp(2\*i - 1)) / dx / 2;

end

px

pp

gx

gxp

x1 = [-5.2:0.1:5.2];

px1 = LagrangeFunction(x1, x, gx);

plot(x1, px1)

hold on;

gx1 = 1 ./ (1 + x1.^2);

plot(x1, gx1)

legend('p(x)','g(x)')

**Output:**









