5) Apply Lagrange's formula inversely to obtain a root of the equation $f(x) = 0$, given that $f(30) = -30$, $f(34) = -13$, $f(38) = 3$, and $f(42) = 18$.

Formula

Lagrange's Inverse Interpolation formula

$$x(y) = \frac{(y-y_1)(y-y_2)\dots(y-y_n)}{(y_0-y_1)(y_0-y_2)\dots(y_0-y_n)} \times x_0 + \frac{(y-y_0)(y-y_2)\dots(y-y_n)}{(y_1-y_0)(y_1-y_2)\dots(y_1-y_n)} \times x_1$$
$$+ \frac{(y-y_0)(y-y_1)(y-y_3)\dots(y-y_n)}{(y_2-y_0)(y_2-y_1)(y_2-y_3)\dots(y_2-y_n)} \times x_2 + \dots + \frac{(y-y_0)(y-y_1)\dots(y-y_{n-1})}{(y_n-y_0)(y_n-y_1)\dots(y_n-y_{n-1})} \times x_n$$

X	f(x)
30	-30
34	-13
38	3
42	18

COULD GO STRAIGHT TO X(0), BUT FIND THE FUNCTION AS USUAL, TO GIVE PLOT

$$X(Y) = \frac{(Y-(-13))(Y-3)(Y-18)}{(-30-13)(-30-3)(-30-18)} \cdot 30 + \frac{(Y-(-30))(Y-3)(Y-18)}{(-13-(-30))(-13-3)(-13-18)} \cdot 34$$
$$+ \frac{(Y-(-30))(Y-(-13))(Y-18)}{(3-(-30))(3-(-13))(3-18)} \cdot 38 + \frac{(Y-(-30))(Y-(-13))(Y-3)}{(18-(-30))(18-(-13))(18-3)} \cdot 42$$

$$X(y) = \frac{y^3}{521730} + \frac{109}{208692} \cdot y^2 + \frac{88679}{347820} y + \frac{431649}{11594}$$

$$X(0) = 37.2304$$

SEE MATLAB PLOT: