$$
\begin{aligned}
n! &= 1, \text{if } n = 1 \\
n! &= n(n-1)!, \text{if } n > 1
\end{aligned}
$$

$$n! = n(n-1)(n-2)\ldots 3 \cdot 2 \cdot 1$$

$$
\begin{aligned}
F_0 &= 0 \\
F_1 &= 1 \\
F_n &= F_{n-1} + F_{n-2}, n > 1
\end{aligned}
$$

$$\begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}^n = \begin{pmatrix} F_{n-1} & F_n \\ F_n & F_{n+1} \end{pmatrix}$$

$$\begin{pmatrix} F_{n-1} & F_n \\ F_n & F_{n+1} \end{pmatrix}^2 = \left(\begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}^n\right)^2 = \begin{pmatrix} 0 & 1 \\ 1 & 1 \end{pmatrix}^{2n} = \begin{pmatrix} F_{2n-1} & F_{2n} \\ F_{2n} & F_{2n+1} \end{pmatrix}$$

$$\begin{pmatrix} F_{n-1} & F_n \\ F_n & F_{n+1} \end{pmatrix}^2 = \begin{pmatrix} F_{2n-1} & F_{2n} \\ F_{2n} & F_{2n+1} \end{pmatrix}$$

$$\begin{pmatrix} F_{n-1} & F_n \\ F_n & F_{n+1} \end{pmatrix}^2 = \begin{pmatrix} F_{n-1}^2 + F_n^2 & F_{n-1}F_n + F_nF_{n+1} \\ F_{n-1}F_n + F_nF_{n+1} & F_n^2 + F_{n+1}^2 \end{pmatrix}$$

$$
\begin{aligned}
F_{2n-1} &= F_{n-1}^2 + F_n^2 \\
F_{2n} &= F_{n-1}F_n + F_nF_{n+1} = F_n^2 + 2F_nF_{n-1} \\
F_{2n+1} &= F_n^2 + F_{n+1}^2
\end{aligned}
$$

$$
\begin{aligned}
F_{2n-1} &= F_{n-1}^2 + F_n^2 \\
F_{2n} &= F_n^2 + 2F_nF_{n-1}
\end{aligned}
$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$f(x) = x^2 + x - 1$$

$$f'(x) = 2x + 1$$

$$x_1 = x_0 - \frac{x_0^2 + x_0 - 1}{2x_0 + 1} = \frac{x_0^2 + 1}{2x_0 + 1}$$

$$\mathbf{x_1 = \frac{x_0^2 + 1}{2x_0 + 1}}$$

$$x_0 = \frac{2}{3}$$

$$x_1 = \frac{\left(\frac{2}{3}\right)^2 + 1}{2\left(\frac{2}{3}\right) + 1} = \frac{13}{21}$$

$$\text{So if } x_0 = \frac{F_3}{F_4},\ \text{then } x_1 = \frac{F_7}{F_8}$$

$$x_0 = \frac{13}{21}$$

$$x_1 = \frac{\left(\frac{13}{21}\right)^2 + 1}{2\left(\frac{13}{21}\right) + 1} = \frac{610}{987}$$

$$\text{So if } x_0 = \frac{F_7}{F_8},\ \text{then } x_1 = \frac{F_{15}}{F_{16}}$$

$$x_0 = \frac{p}{q}, \text{where } p = F_{n-1}, q = F_n, n \text{ even}$$

$$x_1 = \frac{\left(\frac{p}{q}\right)^2 + 1}{2\left(\frac{p}{q}\right) + 1}$$

$$x_1 = \frac{p^2 + q^2}{q(2p+q)} = \frac{F_{2n-1}}{F_{2n}}$$

$$p = F_{n-1}, q = F_n, n \text{ even}$$

$$p_2 + q_2 = F_{2n-1}, q(2p+q) = F_{2n}, n \text{ even}$$

$$F_{2n-1} = {F_{n-1}}^2 + {F_n}^2, n \text{ even}$$

$$F_{2n} = F_n(2F_{n-1} + F_n), n \text{ even}$$

$a \oplus a = 0$
$a \oplus 0 = a$
$a \oplus 1 = \sim a$, where $\sim$ is bit complement.
$a \oplus \sim a = 1$
$a \oplus b = b \oplus a$ (commutativity)
$a \oplus (b \oplus c) = (a \oplus b) \oplus c$ (associativity)
$a \oplus a \oplus a = a$
if $a \oplus b = c$, then $c \oplus b = a$ and $c \oplus a = b$.

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$x_1 = x_0 - \frac{2 - x_0^2}{-2x_0} = \frac{x_0}{2} + \frac{1}{x_0}$$

$$f(x) = 2 - x^2$$

$$f'(x) = -2x$$

$$x_1 = x_0 - \frac{2 - x_0^2}{-2x_0} = \frac{x_0}{2} + \frac{1}{x_0}$$

$$\mathbf{x_1 = \frac{x_0}{2} + \frac{1}{x_0}}$$

$$\begin{pmatrix} r & s \\ t & u \end{pmatrix} = \begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} e & f \\ g & h \end{pmatrix}$$

$$\begin{aligned} r &= ae + bg \\ s &= af + bh \\ t &= ce + dg \\ u &= cf + dh \end{aligned}$$

$$\begin{aligned} P_1 &= a * (f - h) \\ P_2 &= (a + b) * h \\ P_3 &= (c + d) * e \\ P_4 &= d * (g - e) \\ P_5 &= (a + d) * (e + h) \\ P_6 &= (b - d) * (g + h) \\ P_7 &= (a - c) * (e + f) \end{aligned}$$

$$\begin{aligned} P_1 + P_2 &= r \\ P_3 + P_3 &= s \\ P_5 + P_4 - P_2 + P_6 &= t \\ P_5 + P_1 - P_3 - P_7 &= u \end{aligned}$$

$$
\begin{aligned}
M_1 &= (b-d)*(g+h) \\
M_2 &= (a+d)*(e+h) \\
M_3 &= (a-c)*(e+f) \\
M_4 &= (a+b)*h \\
M_5 &= a*(f-h) \\
M_6 &= d*(g-e) \\
M_7 &= (c+d)*e \\
M_1+M_2-M_4+M_5 &= r \\
M_4+M_5 &= s \\
M_6+M_7 &= t \\
M_2-M_3+M_5-M_7 &= u
\end{aligned}
$$

$$
\begin{aligned}
M_1 &= (b-d)*(g+h) & M_1+M_2-M_4+M_5 &= r \\
M_2 &= (a+d)*(e+h) & M_4+M_5 &= s \\
M_3 &= (a-c)*(e+f) & M_6+M_7 &= t \\
M_4 &= (a+b)*h & M_2-M_3+M_5-M_7 &= u \\
M_5 &= a*(f-h) & & \\
M_6 &= d*(g-e) & & \\
M_7 &= (c+d)*e & &
\end{aligned}
$$

$$
\begin{aligned}
K_1 &= c + d \\
K_2 &= K_1 - a \\
K_3 &= a - c \\
K_4 &= b - K_2 \\
K_5 &= f - e \\
K_6 &= h - K_5 \\
K_7 &= h - f \\
K_8 &= K_6 - g \\
M_1 &= K_2 * K_6 \\
M_2 &= a * e \\
M_3 &= b * g \\
M_4 &= K_3 * K_7 \\
M_5 &= K_1 * K_5 \\
M_6 &= K_4 * h \\
M_7 &= d * K_8 \\
L_1 &= M_1 + M_2 \\
L_2 &= L_1 + M_4 \\
M_2 + M_3 &= r \\
L_1 + M_5 + M_6 &= s \\
L_2 - M_7 &= t \\
L_2 + M_5 &= u
\end{aligned}
$$

$$
\begin{array}{lll}
K_1 = c + d & M_1 = K_2 * K_6 & L_1 = M_1 + M_2 \\
K_2 = K_1 - a & M_2 = a * e & L_2 = L_1 + M_4 \\
K_3 = a - c & M_3 = b * g & \\
K_4 = b - K_2 & M_4 = K_3 * K_7 & M_2 + M_3 = r \\
K_5 = f - e & M_5 = K_1 * K_5 & L_1 + M_5 + M_6 = s \\
K_6 = h - K_5 & M_6 = K_4 * h & L_2 - M_7 = t \\
K_7 = h - f & M_7 = d * K_8 & L_2 + M_5 = u \\
K_8 = K_6 - g & &
\end{array}
$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)}$$

$$f(x) = \frac{1}{x} - d$$

$$f'(x) = -\frac{1}{x^2}$$

$$x_1 = x_0 - \frac{\frac{1}{x_0} - d}{-\frac{1}{x_0^2}} = x_0 + x_0^2(\frac{1}{x_0} - d) = 2x_0^2 - dx_0$$

$$\mathbf{x_1 = x_0(2 - dx_0})$$

$$
\begin{aligned}
K_1 &= A_{21} + A_{22} & M_1 &= K_2 \cdot K_6 & L_1 &= M_1 + M_2 \\
K_2 &= K_1 - A_{11} & M_2 &= A_{11} \cdot B_{11} & L_2 &= L_1 + M_4 \\
K_3 &= A_{11} - A_{21} & M_3 &= A_{12} \cdot B_{21} & & \\
K_4 &= A_{12} - K_2 & M_4 &= K_3 \cdot K_7 & M_2 + M_3 &= C_{11} \\
K_5 &= B_{12} - B_{11} & M_5 &= K_1 \cdot K_5 & L_1 + M_5 + M_6 &= C_{12} \\
K_6 &= B_{22} - K_5 & M_6 &= K_4 \cdot B_{22} & L_2 - M_7 &= C_{21} \\
K_7 &= B_{22} - B_{12} & M_7 &= A_{22} \cdot K_8 & L_2 + M_5 &= C_{22} \\
K_8 &= K_6 - B_{21} & & & &
\end{aligned}
$$

$$\begin{pmatrix} C_{11} & C_{12} \\ C_{21} & C_{22} \end{pmatrix} = \begin{pmatrix} A_{11} & A_{12} \\ A_{21} & A_{22} \end{pmatrix} \begin{pmatrix} B_{11} & B_{12} \\ B_{21} & B_{22} \end{pmatrix}$$

$$\begin{aligned} C_{11} &= A_{11} \cdot B_{11} + A_{12} \cdot B_{21} \\ C_{12} &= A_{11} \cdot B_{12} + A_{12} \cdot B_{22} \\ C_{21} &= A_{21} \cdot B_{11} + A_{22} \cdot B_{21} \\ C_{22} &= A_{21} \cdot B_{12} + A_{22} \cdot B_{22} \end{aligned}$$

$$\begin{aligned} P_1 &= A_{11} \cdot (B_{12} - B_{22}) \\ P_2 &= (A_{11} + A_{12}) \cdot B_{22} \\ P_3 &= (A_{21} + A_{22}) \cdot B_{11} \\ P_4 &= A_{22} \cdot (B_{21} - B_{11}) \\ P_5 &= (A_{11} + A_{22}) \cdot (B_{11} + B_{22}) \\ P_6 &= (A_{12} - A_{22}) \cdot (B_{21} + B_{22}) \\ P_7 &= (A_{11} - A_{21}) \cdot (B_{11} + B_{12}) \end{aligned}$$

$$\begin{aligned} P_5 + P_4 - P_2 + P_6 &= C_{11} \\ P_1 + P_2 &= C_{12} \\ P_3 + P_4 &= C_{21} \\ P_5 + P_1 - P_3 - P_7 &= C_{22} \end{aligned}$$