



# Strassen's idea

- Multiply  $2 \times 2$  matrices with only 7 recursive mults.

$$P_1 = a \cdot (f - h)$$

$$P_2 = (a + b) \cdot h$$

$$P_3 = (c + d) \cdot e$$

$$P_4 = d \cdot (g - e)$$

$$P_5 = (a + d) \cdot (e + h)$$

$$P_6 = (b - d) \cdot (g + h)$$

$$P_7 = (a - c) \cdot (e + f)$$

$$\begin{aligned} r &= P_5 + P_4 - P_2 + P_6 \\ &= (a + d)(e + h) \\ &\quad + d(g - e) - (a + b)h \\ &\quad + (b - d)(g + h) \\ &= ae + ah + de + dh \\ &\quad + dg - de - ah - bh \\ &\quad + bg + bh - dg - dh \\ &= ae + bg \end{aligned}$$