$$\begin{cases} a_{n+1} = 2a_n \\ a_0 = 1 \end{cases} \Rightarrow \begin{cases} a_1 = 2 \\ a_2 = 4 \\ a_3 = 8 \end{cases}$$

$$a_0, a_1, a_2, \dots a_n$$

م 17-01:15 لاوش

$$f(n+1) = 2f(n)$$

$$f(n) = n$$

$$f(n+1) = n+1 = f(n)+1$$

م 17-01:27 لاوش

$$f(n) = n!$$

$$= n \times (n-1) \times (n-2) \cdots 1$$

$$f(n+1) = (n+1)!$$

$$= (n+1) \times \underbrace{n \times (n-1) \times \dots 1}$$

$$f(n+1) = (n+1)\, f(n)$$

م 17-01:29 لاوش

م 17-01:34 لاوش

$$1, 3, 9, 27, 81, \dots$$

$a_1 = 1$ $\quad a_2 = 3 \times \underset{a_1}{1}$

$a_n = ?$ $\quad a_3 = 3 \times \underset{a_2}{3}$

$$a_4 = 3 \times a_3$$

$$a_n = 3 \times a_{n-1}$$

م 17-01:34 لاوش

$$a_0 = 1$$

$$a_{n+1} = \frac{2}{a_n}$$

$$a_1, a_2, a_3$$

$$a_n(n)$$

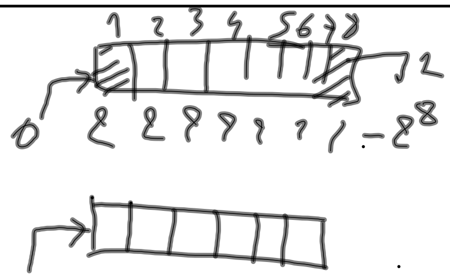
$$a_n = \begin{cases} 2 & \text{if } n \text{ odd} \\ 1 & \text{if } n \text{ even} \end{cases}$$

$$a_1 = 2/1 = 2$$

$$a_2 = 2/2 = 1$$

$$a_3 = 2/1 = 2$$

م 17-01:39 لاوش



م 17-01:45 لاوش

Prove by induction that

$4+10+16+\cdots+(6n-2) = n(3n+1)$ for all $n \in \mathbb{N}^*$

1) $n=1$, $4=4$

2) Hypothesis $n=k$

$4+10+16+\cdots+(6k-2) = k(3k+1)$

م 17-02:01 لاوش

$\underbrace{4+10+16+\cdots+(6k-2)}$

$+(6k+4) \overset{?}{=} (k+1)(3k+4)$

Hypothesis: $3k^2+7k+4$

$k(3k+1)+(6k+4)$

$k(3k+1)+2(3k+2)$

$3k^2+7k+4$

م 17-02:09 لاوش

$R = \{(m,n) \in \mathbb{N},$

$m-n = 0 \bmod 5$

- Reflexive (m,m) $m-m=0$
- symmetric if $m-n = 0 \bmod 5$, $n-m = 0 \bmod 5$
- transitive

$m-n = 0 \bmod 5$, $10-5=5$

$n-p = 0 \bmod 5$

م 17-02:25 لاوش

if $m-n = 0 \bmod 5$

if $n-p = 0 \bmod 5$

$m-p = 0 \bmod 5$

$25-15$ $\quad 7-2 = 0 \bmod 5$

$15-10$ $\quad 2-(-3) = 0 \bmod 5$

$7-(-3) = 10 = 0 \bmod 5$

م 17-02:35 لاوش

$m^2+n^2=2$

Ref: $m^2+m^2=2$
$2m^2=2$
$m^2=1$

not reflexive

م 17-02:39 لاوش

if $m^2+n^2=2$ [symmetric]
$n^2+m^2=2$

$m^2+n^2=2$
$n^2+p^2=2$ } $m^2+p^2=2$ not
$m^2=p^2$ transitive

م 17-02:41 لاوش

$p \wedge q$
- p
- q

p
$p \vee q$

$p \to q$
$\neg q \to \neg p$

$$\begin{array}{l} p \to q \\ q \to r \\ \hline p \to r \end{array}$$

م 17-02:52 لاوش

$$\begin{array}{l} p \to q \\ \neg q \\ \hline \neg p \end{array}$$

$$\begin{array}{l} p \to q \\ q \to r \\ \neg r \\ \hline \neg p \end{array}$$

$$\begin{array}{l} p \to r \\ \neg r \\ \hline \neg p \end{array}$$

م 17-02:55 لاوش