

Lectia 10.

1. a) $7^{14} \cdot 7^{31} = 7^{14+31} = 7^{45}$

b) $16^{11} \cdot 16^{22} = 16^{11+22} = 16^{33}$

c) $3^3 \cdot 3^8 = 3^{3+8} = 3^{11}$

d) $5^9 \cdot 5^{14} = 5^{9+14} = 5^{23}$

e) $23^{12} \cdot 23^{45} = 23^{12+45} = 23^{57}$

f) $5^{32} \cdot 5^{121} = 5^{32+121} = 5^{153}$

2. a) $2^{91} : 2^{21} = 2^{91-21} = 2^{70}$

b) $75^{84} : 75^{81} = 75^{84-81} = 75^3$

c) $3^{25} : 3^{18} = 3^{25-18} = 3^7$

d) $5^{91} : 5^{52} = 5^{91-52} = 5^{39}$

e) $7^{34} : 7^9 = 7^{34-9} = 7^{25}$

f) $14^{45} : 14^{20} = 14^{45-20} = 14^{25}$

3. a) $(3^4)^7 = 3^{4 \cdot 7} = 3^{28}$

b) $(13^8)^9 = 13^{8 \cdot 9} = 13^{72}$

c) $(17^3)^{18} = 17^{3 \cdot 18} = 17^{54}$

d) $(7^{11})^4 = 7^{11 \cdot 4} = 7^{44}$

e) $(16^8)^6 = 16^{8 \cdot 6} = 16^{48}$

f) $(5^4)^3 = 5^{4 \cdot 3} = 5^{12}$

$$4. a) 3^{16} \cdot 7^{16} = (3 \cdot 7)^{16} = 21^{16}$$

$$b) 7^{10} \cdot 5^{10} = (7 \cdot 5)^{10} = 35^{10}$$

$$c) 2^{34} \cdot 5^{34} \cdot 7^{34} = (2 \cdot 5 \cdot 7)^{34} = 70^{34}$$

$$d) 5^4 \cdot 2^4 = (5 \cdot 2)^4 = 10^4$$

$$e) 15^{12} \cdot 11^{12} = (15 \cdot 11)^{12} = 165^{12}$$

$$f) 6^{30} \cdot 7^{30} \cdot 2^{30} = (6 \cdot 7 \cdot 2)^{30} = 84^{30}$$

$$5. a) 12^{24} : 3^{24} = (12 : 3)^{24} = 4^{24}$$

$$b) 125^{45} : 5^{45} = (125 : 5)^{45} = 25^{45}$$

$$c) 18^{17} : 9^{17} = (18 : 9)^{17} = 2^{17}$$

$$d) 9^{36} : 3^{36} = (9 : 3)^{36} = 3^{36}$$

$$e) 9^{21} : 3^{21} = (9 : 3)^{21} = 3^{21}$$

$$f) 125^8 : 5^8 = (125 : 5)^8 = 25^8$$

$$6. a) 25^{10} \cdot 5^{32} \cdot 125^5 = (5^2)^{10} \cdot 5^{32} \cdot (5^3)^5 = 5^{2 \cdot 10} \cdot 5^{32} \cdot 5^{3 \cdot 5} =$$
$$\begin{matrix} 25 = 5^2 \\ 125 = 5^3 \end{matrix} \quad = 5^{20} \cdot 5^{32} \cdot 5^{15} = 5^{20+32+15} = 5^{67}$$

$$b) 9^4 \cdot 27^5 \cdot 3^{14} = (3^2)^4 \cdot (3^3)^5 \cdot 3^{14} = 3^{2 \cdot 4} \cdot 3^{3 \cdot 5} \cdot 3^{14} =$$
$$= 3^8 \cdot 3^{15} \cdot 3^{14} = 3^{8+15+14} = 3^{37}$$

$$c) 2^{15} \cdot 4^{12} \cdot 8^6 = 2^{15} \cdot (2^2)^{12} \cdot (2^3)^6 = 2^{15} \cdot 2^{2 \cdot 12} \cdot 2^{3 \cdot 6} =$$
$$= 2^{15} \cdot 2^{24} \cdot 2^{18} = 2^{15+24+18} = 2^{57}$$

$$7. a) 2^{76} + 2^{78} + 2^{80} = 1 \cdot \underline{2^{76}} + 2 \cdot \underline{2^{76}} + 2^4 \cdot \underline{2^{76}} = 2^{76} (1 + 2^2 + 2^4) = 2^{76} \cdot (1 + 4 + 16) = 2^{76} \cdot 21$$

$$b) 3 \cdot 5^{47} + 2 \cdot 5^{48} + 6 \cdot 5^{49} = 3 \cdot \underline{5^{47}} + 2 \cdot 5 \cdot \underline{5^{47}} + 6 \cdot 5^2 \cdot \underline{5^{47}} = 5^{47} \cdot (3 + 2 \cdot 5 + 6 \cdot 5^2) = 5^{47} \cdot (3 + 10 + 6 \cdot 25) = 5^{47} \cdot (13 + 150) = 5^{47} \cdot 163$$

$$c) 13^{14} \cdot 3 - 13^{13} \cdot 2 - 13^{12} = \underline{13^{12}} \cdot 13^2 \cdot 3 - \underline{13^{12}} \cdot 13 \cdot 2 - \underline{13^{12}} \cdot 1 = 13^{12} \cdot (13^2 \cdot 3 - 13 \cdot 2 - 1) = 13^{12} \cdot (169 \cdot 3 - 26 - 1) = 13^{12} \cdot (507 - 26 - 1) = 13^{12} \cdot (481 - 1) = 13^{12} \cdot 480$$

$$8. a) 5^{46} = 5^{2 \cdot 23} = (5^{23})^2$$

$$b) 23^{100} = 23^{2 \cdot 50} = (23^{50})^2$$

$$c) (7^6)^5 = 7^{6 \cdot 5} = 7^{30} = 7^{2 \cdot 15} = (7^{15})^2$$

$$d) 25^{37} = (5^2)^{37} = (5^{37})^2$$

$$e) 4^{75} = (2^2)^{75} = (2^{75})^2$$

$$f) 625^7 = (25^2)^7 = (25^7)^2$$

$$g) 16 \cdot 25 = 4^2 \cdot 5^2 = (4 \cdot 5)^2 = 20^2$$

$$h) 2^{18} \cdot 3^6 = 2^{2 \cdot 9} \cdot 3^{2 \cdot 3} = (2^9)^2 \cdot (3^3)^2 = (2^9 \cdot 3^3)^2$$

$$i) 25 \cdot 3^{18} = 5^2 \cdot 3^{2 \cdot 9} = 5^2 \cdot (3^9)^2 = (5 \cdot 3^9)^2$$