

$$a) \pi_{maker} \left(\sigma_{(model=model2 \wedge type=laptop \wedge speed \geq 2.00)} \left(Product \times (\rho_{(model \rightarrow model2)} Laptop) \right) \right)$$

$$b) \pi_{model,type,price} \left(\sigma_{maker=B \wedge model=model2 \wedge type=pc} Product \times (\rho_{(model \rightarrow model2)} PC) \right) \cup$$

$$\pi_{model,type,price} \left(\sigma_{maker=B \wedge model=model2 \wedge type=laptop} Product \times (\rho_{(model \rightarrow model2)} Laptop) \right) \cup$$

$$\pi_{model,type,price} \left(\sigma_{maker=B \wedge model=model2 \wedge type=printer} Product \times (\rho_{(model \rightarrow model2)} Printer) \right)$$

c)

$$\pi_{model1,model2} \left(\sigma_{model1 > model2, speed1=speed2, ram1=ram2} X \right)$$

$$X = \left(\begin{array}{c} \rho_{(model \rightarrow model1, speed \rightarrow speed1, ram \rightarrow ram1, hd \rightarrow hd1, price \rightarrow price1)} PC \\ \bowtie \\ \rho_{(model \rightarrow model2, speed \rightarrow speed2, ram \rightarrow ram2, hd \rightarrow hd2, price \rightarrow price2)} PC \end{array} \right)$$

d)

$$\pi_{maker} \left(\sigma_{printer} \left(Product \bowtie_{model=model1} (x) \right) \right)$$

$$x = (\rho_{(model \rightarrow model1, price \rightarrow price1)} Printer \bowtie_{price1 < price2} \rho_{(model \rightarrow model2, price \rightarrow price2)} Printer)$$

e)

$$\pi_{model} \left(\sigma_{type=pc, type2=pc} (X) \right) - \pi_{model} \left(\sigma_{type=pc, type2=pc, type3=pc} Y \right)$$

X

$$= (Product \bowtie_{model=model2 \wedge maker \neq maker2} \rho_{(maker \rightarrow maker2, model \rightarrow model2, type \rightarrow type2)} Product)$$

$$Y = (Product \bowtie_{model=model2 \wedge maker \neq maker2} \rho_{(maker \rightarrow maker2, model \rightarrow model2, type \rightarrow type2)} Product$$

$$\bowtie_{model=model3 \wedge maker \neq maker3 \wedge maker2 \neq maker3} \rho_{(maker \rightarrow maker3, model \rightarrow model3, type \rightarrow type3)} Product)$$