

## Graph-Theoretic Property: *atis* GraphTheoreticProperties

(Graph-theoretic properties are those properties that are part of the meta-theory and have been abducted from graph theory to be used as a tool to provide solutions concerning the theory. Those solutions may be assigned as values to components or relations of the theory and thereby become part of the theory.)

### Graph Theoretic Connected Properties:

**Completely connected elements,**  ${}_{cc}E, =_{df} \{(x,y) | \forall (x,y)[(x,y), (y,x) \in {}_{pc}E]\}$

**Connected elements,**  ${}_cE, =_{df} \{(x,y) | \exists \gamma[(x,y) \in {}_{pc}E \vee (y,x) \in {}_{pc}E]\}$

**Disconnected elements,**  ${}_dE, =_{df} \{x | \forall (x,y)[(x,y), (y,x) \notin {}_{pc}E]\}$

**Initiating elements,**  ${}_iE, =_{df} \{x | \forall \gamma[(x,y) \in {}_{pc}E]\}$

**Path-connected elements,**

$${}_{pc}E, =_{df} \{(x,y) | (x = x_0, x_1, x_2, \dots, x_{n-1}, x_n = y) \wedge \forall (x_i, y_i)_{i < n} [\gamma_i = x_{i+1}]\}$$

**Primary initiating elements,**  ${}_{pi}E, =_{df} \{x | \exists \gamma[(x,y) \in {}_{pc}E \wedge \forall u(u,x) \notin {}_{pc}E]\}$

**Receiving elements,**  ${}_rE, =_{df} \{y | \forall \gamma[(x,y) \in {}_{pc}E]\}$

**Terminating elements,**  ${}_tE, =_{df} \{y | \forall \gamma[(x,y) \in {}_{pc}E \wedge \forall u(y,u) \notin {}_{pc}E]\}$

**Unilaterally connected elements,**  ${}_{uc}E, =_{df} \{(x,y) | \forall (x,y)[(x,y) \in {}_{pc}E \wedge (y,x) \notin {}_{pc}E]\}$