# CHAIN RULE DIAGRAMS

Construct a tree diagram and a chain rule formula for each of the indicated derivatives.

1. $z = f(x,y),\ x = x(u,v),\ y = y(u,v),\ \dfrac{\partial z}{\partial u} = ?$

2. $z = f(x,y),\ x = x(u,v),\ y = y(u,v),\ u = u(s,t),\ v = v(s,t),\ \dfrac{\partial z}{\partial s} = ?$

3. $z = f(x,y),\ x = x(t),\ y = y(t),\ \dfrac{dz}{dt} = ?$

4. $z = f(x,y),\ x = x(s),\ y = y(t),\ \dfrac{\partial z}{\partial t} = ?$

5. $w = f(x,y,z),\ x = x(t,u,v),\ y = y(t,u,v),\ z = z(t,u,v),\ \dfrac{\partial w}{\partial t} = ?$

6. $w = f(x,y,z),\ x = x(u,v),\ y = y(u,v),\ z = z(u,v),\ u = u(s),\ v = v(t),\ \dfrac{\partial w}{\partial t} = ?$

7. $w = f(x,y,z),\ x = x(u,v),\ y = y(u,v),\ z = z(u,v),\ u = u(t),\ v = v(t),\ \dfrac{dw}{dt} = ?$

8. $w = f(x,y,z),\ x = x(u,v),\ y = y(u,v),\ z = z(u,v),\ \dfrac{\partial w}{\partial v} = ?$