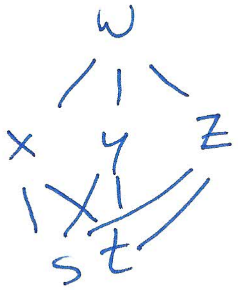
9. a)



$$\frac{\partial w}{\partial s} = \frac{\partial w}{\partial x}\cdot\frac{\partial x}{\partial s} + \frac{\partial w}{\partial y}\cdot\frac{\partial y}{\partial s} + \frac{\partial w}{\partial z}\cdot\frac{\partial z}{\partial s}$$

$$\frac{\partial w}{\partial t} = \frac{\partial w}{\partial x}\cdot\frac{\partial x}{\partial t} + \frac{\partial w}{\partial y}\cdot\frac{\partial y}{\partial t} + \frac{\partial w}{\partial z}\cdot\frac{\partial z}{\partial t}$$

$$\frac{\partial w}{\partial x} = 2x \quad \frac{\partial w}{\partial y} = -2y \quad \frac{\partial w}{\partial z} = 2z \quad \frac{\partial x}{\partial s} = 2s \quad \frac{\partial y}{\partial s} = -2s$$

$$\frac{\partial z}{\partial s} = t \quad \frac{\partial x}{\partial t} = 2t \quad \frac{\partial y}{\partial t} = 2t \quad \frac{\partial z}{\partial t} = s$$

So
$$\frac{\partial w}{\partial s} = 2x\cdot 2s + (-2y)\cdot(-2s) + 2z\cdot t$$
$$= 4xs + 4ys + 2zt$$

$$\frac{\partial w}{\partial t} = 2x\cdot 2t + (-2y)\cdot(2t) + (2z)\cdot s$$
$$= 4xt - 4yt + 2zs$$

b) We define $F(x,y,z) = xe^y + y^2\ln(x) + z^2y - 8z$

$$F_x(x,y,z) = e^y + \frac{y^2}{x}$$
$$F_y(x,y,z) = xe^y + 2y\ln(x) + z^2$$
$$F_z(x,y,z) = 2zy - 8$$

Then
$$\frac{\partial z}{\partial x} = -\frac{F_x}{F_z} = -\frac{e^y + \frac{y^2}{x}}{2zy-8} = -\frac{xe^y + y^2}{2zyx - 8x}$$

$$\frac{\partial z}{\partial y} = -\frac{F_y}{F_z} = -\frac{xe^y + 2y\ln(x) + z^2}{2zy - 8}$$