6. $z = \dfrac{x}{y}$, $x = se^t$, $y = 1 + se^{-t}$ $\Rightarrow$

$$\frac{\partial z}{\partial s} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial s} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial s} = \frac{1}{y}\left(e^t\right) + \left(-\frac{x}{y^2}\right)\left(e^{-t}\right) = \frac{1}{y}e^t - \frac{x}{y^2}e^{-t}$$

$$\frac{\partial z}{\partial t} = \frac{\partial z}{\partial x}\frac{\partial x}{\partial t} + \frac{\partial z}{\partial y}\frac{\partial y}{\partial t} = \frac{1}{y}\left(se^t\right) + \left(-\frac{x}{y^2}\right)\left(-se^{-t}\right) = \frac{s}{y}e^t + \frac{xs}{y^2}e^{-t}$$

17. $z = y^2 \tan x$, $x = t^2uv$, $y = u + tv^2$ $\Rightarrow$
$\partial z/\partial t = \left(y^2 \sec^2 x\right) 2tuv + (2y \tan x)\, v^2$, $\partial z/\partial u = \left(y^2 \sec^2 x\right) t^2v + 2y \tan x$,
$\partial z/\partial v = \left(y^2 \sec^2 x\right) t^2u + (2y \tan x)\, 2tv$. When $t = 2$, $u = 1$ and $v = 0$, we have $x = 0$, $y = 1$, so $\partial z/\partial t = 0$, $\partial z/\partial u = 0$, $\partial z/\partial v = 4$.

18. $z = \dfrac{x}{y}$, $x = re^{st}$, $y = rse^t$ $\Rightarrow$

$\dfrac{\partial z}{\partial r} = \dfrac{1}{y}e^{st} + \dfrac{-x}{y^2}se^t$, $\dfrac{\partial z}{\partial s} = \dfrac{1}{y}rte^{st} - \dfrac{x}{y^2}re^t$, $\dfrac{\partial z}{\partial t} = \dfrac{1}{y}rse^{st} - \dfrac{x}{y^2}rse^t$. When $r = 1$, $s = 2$ and $t = 0$, we have $x = 1$, $y = 2$, so $\partial z/\partial r = \frac{1}{2} + \frac{-1}{4} \cdot 2 = 0$, $\partial z/\partial s = 0 - \frac{1}{4} = -\frac{1}{4}$ and $\partial z/\partial t = \frac{1}{2} \cdot 2 - \frac{1}{4} \cdot 2 = \frac{1}{2}$.

24. $xyz = \cos(x + y + z)$. Let $F(x, y, z) = xyz - \cos(x + y + z) = 0$, so

$$\frac{\partial z}{\partial x} = -\frac{F_x}{F_z} = -\frac{yz + \sin(x + y + z)}{xy + \sin(x + y + z)},\ \frac{\partial z}{\partial y} = -\frac{F_y}{F_z} = -\frac{xz + \sin(x + y + z)}{xy + \sin(x + y + z)}.$$

28. (a) Since $\partial W/\partial T$ is negative, a rise in average temperature (while annual rainfall remains constant) causes a decrease in wheat production at the current production levels. Since $\partial W/\partial R$ is positive, an increase in annual rainfall (while the average temperature remains constant) causes an increase in wheat production.

(b) Since the average temperature is rising at a rate of 0.15 °C/year, we know that $dT/dt = 0.15$. Since rainfall is decreasing at a rate of 0.1 cm/year, we know $dR/dt = -0.1$. Then, by the Chain Rule, $\dfrac{dW}{dt} = \dfrac{\partial W}{\partial T}\dfrac{dT}{dt} + \dfrac{\partial W}{\partial R}\dfrac{dR}{dt} = (-2)(0.15) + (8)(-0.1) = -1.1$. Thus we estimate that wheat production will decrease at a rate of 1.1 units/year.