6. $\ln y = x \ln\cos x$

$$\frac{y'}{y} = \ln\cos x + x \cdot \frac{1}{\cos x} \cdot (-\sin x)$$

$$y \cdot \frac{y'}{y} = \left(\ln\cos x - x\frac{\sin x}{\cos x}\right) y$$

$$\boxed{y' = (\ln\cos x - x\tan x)(\cos x)^x}$$

7a. $h' = 28 - 9.8t$

$h'(3) = 28 - 9.8(3) = \boxed{-1.4 \text{ m/s}}$

7b. $h = 0$

$-4.9t^2 + 28t + 6 = 0$

Quadratic Formula:

$$t = \frac{-28 \pm \sqrt{28^2 - 4(-4.9)(6)}}{2(-4.9)}$$

$$= \frac{-28 \pm \sqrt{901.6}}{-9.8}$$

$t = \frac{-28 + \sqrt{901.6}}{-9.8}$ or $t = \frac{-28 - \sqrt{901.6}}{-9.8}$

$\approx -.207$ $\quad \boxed{t \approx 5.925}$

7c. $h'(5.92) = 28 - 9.8(5.92)$

$= \boxed{-30.016 \text{ m/s}}$

8a. $y = Ce^{kt}$

$580 = 200e^{k(1)}$

$\frac{580}{200} = \frac{200e^k}{200}$

$2.9 = e^k$

$\ln 2.9 = k \ln e$

$\ln 2.9 = k$ since $\ln e = 1$

$y = Ce^{\ln 2.9\, t}$

$y = 200(e^{\ln 2.9})^t$

$\boxed{y = 200(2.9)^t}$

8b. $y(5) = 200(2.9)^5$

$\approx \boxed{41022 \text{ cells}}$

8c. $y' = ky$

$y' = (\ln 2.9)(200)(2.9)^t$

$y'(5) = (\ln 2.9)(200)(2.9)^5$

$\approx \boxed{43677 \text{ cells/hr}}$

8d. $y = 80000$

$80000 = 200(2.9)^t$

$\frac{80000}{200} = \frac{200(2.9)^t}{200}$

$400 = (2.9)^t$

$\frac{\ln 400}{\ln 2.9} = \frac{t \ln 2.9}{\ln 2.9}$

$5.63 \approx t$

$\boxed{\text{About } 5.63 \text{ hours}}$