7. The circle $r = 3\cos\theta$ and the cardioid $r = 1 + \cos\theta$ intersect at $\theta = -\frac{\pi}{3} = \frac{\pi}{3}$. Hence

$$\begin{aligned} Area &= \frac{1}{2}\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} [3\cos\theta]^2 - [1+\cos\theta]^2 d\theta \\ &= \frac{1}{2}\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} 8\cos^2\theta - 2\cos\theta - 1\, d\theta \\ &= \frac{1}{2}\int_{-\frac{\pi}{3}}^{\frac{\pi}{3}} 8(\frac{1+\cos 2\theta}{2}) - 2\cos\theta - 1\, d\theta \\ &= \pi. \end{aligned}$$

8. As $y = t^2 + 3t + 1$ and $x = \ln(2t+1)$, $\frac{dy}{dt} = 2t + 3$ and $\frac{dx}{dt} = \frac{2}{2t+1}$. Hence $\frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{1}{2}(2t+3)(2t+1)$. When $t = 1$, $\frac{dy}{dx} = \frac{15}{2}$.
$\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\frac{dy}{dx}}{\frac{dx}{dt}} = 2(t+1)(2t+1)$. When $t = 1$, $\frac{d^2y}{dx^2} = 12$.