W10 Q1

$g(r, \theta, z) = (2r\cos\theta, 3r\sin\theta, z)$

$$D_g = \begin{pmatrix} 2\cos\theta & -2r\sin\theta & 0 \\ 3\sin\theta & 3r\cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

$$\begin{aligned} \text{Det}(D_g) &= 1\left(2\cos\theta(3r\cos\theta) + 2r\sin\theta(3\sin\theta)\right) \\ &= 6r\cos^2\theta + 6r\sin^2\theta \\ &= 6r\left(\cos^2\theta + \sin^2\theta\right) \\ &= 6r \end{aligned}$$