

$$7. \quad F(x, y) = \underbrace{5xy}_M \vec{i} + \underbrace{(x+y)}_N \vec{j}$$

$$x^2 + y^2 = 16$$

$$= \iint_R (1 - 5x)$$

$$= \int_{\theta=0}^{2\pi} \int_{r=0}^4 (1 - 5r \cos \theta) r \, dr \, d\theta$$

$$= \int_{\theta=0}^{2\pi} \int_{r=0}^4 (r - 5r^2 \cos \theta) \, dr \, d\theta$$

$$= \int_{\theta=0}^{2\pi} \left[\frac{1}{2} r^2 - \frac{5}{3} r^3 \cos \theta \right]_{r=0}^{r=4} d\theta$$

$$= \int_{\theta=0}^{2\pi} \left[\frac{1}{2} (4)^2 - \frac{5}{3} (4)^3 \cos \theta - \left(\frac{1}{2} (0)^2 - \frac{5}{3} (0)^3 \cos \theta \right) \right] d\theta$$

$$= \int_{\theta=0}^{2\pi} \left(8 - \frac{320}{3} \cos \theta \right) d\theta$$

$$= \left[8\theta - \frac{320}{3} \sin \theta \right]_{\theta=0}^{\theta=2\pi}$$

$$= 8(2\pi) - \frac{320}{3} \sin 2\pi - \left(8(0) - \frac{320}{3} \sin 0 \right)$$

$$= \boxed{16\pi}$$



$$x = r \cos \theta$$

$$y = r \sin \theta$$