Exercise 10

Given, $x = 9y + 1$ about the line $x = -1$

$\Rightarrow$

$0 \le y \le 3$

Now,

$$S_A = \int_a^b 2\pi\, g(y) \sqrt{1 + [g'(y)]^2}\, dy$$

$\because g'(y) = 9 \quad \therefore (g'(y))^2 = 9^2 = 81$

$\therefore$ ~~Radius~~ $P = \therefore \sqrt{1 + (g'(y))^2} = \sqrt{1+81} = \sqrt{82}$

$r = 9y + 1 + 1 = 9y + 2$

Now,

$$S_A = \int_0^3 2\pi (9y+2)\sqrt{82}\, dy$$

$$= 2\pi\sqrt{82} \int_0^3 (9y+2)\, dy$$

$$= 2\pi\sqrt{82} \left[\frac{9y^2}{2} + 2y\right]_0^3$$

$$= 2\pi\sqrt{82} \left[\frac{9 \times 3^2}{2} + 6 - 0\right]$$

$$= 2\pi\sqrt{82} \times \frac{87}{2} \Rightarrow 2\pi\sqrt{82} \times \frac{22}{2}$$

$$= \frac{174\pi\sqrt{82}}{2} \text{ unit}^2 \Rightarrow \frac{186\pi\sqrt{82}}{2} \text{ Unit}^2$$

Ans.