

Calculus II, Section 8.1, #6
Arc Length

Set up an integral that represents the length of the curve. Then use your calculator to find the length correct to four decimal places.¹

$$x = y^2 - 2y \quad 0 \leq y \leq 2$$

Since x is given as a function of y , we will use the arc length formula

$$L = \int_{y=c}^{y=d} \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$$

We have $x = y^2 - 2y$, so $\frac{dx}{dy} = 2y - 2$ and $1 + \left(\frac{dx}{dy}\right)^2 = 1 + (2y - 2)^2$.

Thus,

$$L = \int_{y=0}^{y=2} \sqrt{1 + (2y - 2)^2} dy \approx 2.9579$$

¹Stewart, *Calculus, Early Transcendentals*, p. 549, #6.