

10.3 Exercises

14

15

29 If the arc of the curve in Exercise 14 is rotated about the x -axis, estimate the area of the resulting surface using Simpson's Rule with $n = 4$, where the dots indicate derivatives with respect to t .

x -axis, estimate the area of the resulting surface using Simpson's Rule with $n = 4$.

29–30 □ Find the surface area generated by rotating the given curve about the y -axis.

29. $x = 3t^2, \quad y = 2t^3, \quad 0 \leq t \leq 5$

30. $x = e^t - t, \quad y = 4e^{t/2}, \quad 0 \leq t \leq 1$

31. Find the surface area of the ellipsoid obtained by rotating the ellipse $x = a \cos \theta, y = b \sin \theta$ ($a > b$) about (a) the x -axis

$\dot{x} = dx/dt$. [Hint: Use $\phi = \tan^{-1}(dy/dx)$ and Equation 10.2.2 to find $d\phi/dt$. Then use the Chain Rule to find $d\phi/ds$.]

(b) By regarding a curve $y = f(x)$ as the parametric curve $x = x, y = f(x)$, with parameter x , show that the formula in part (a) becomes

$$\kappa = \frac{|d^2y/dx^2|}{[1 + (dy/dx)^2]^{3/2}}$$

$y \uparrow$

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