10.3 Exercises

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

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