Supplementary Homework Exercises for Section 10.5: Calculus with Parametric Equations (part 3)

Exercises

Answer each of the following questions.

S1. Consider the parametric curve given by $x = t - \sin(t), y = 1 - \cos(t)$. This curve is called a *cycloid*. Find the area under one arch of the cycloid.

S2. Find an area formula for the ellipse given by $x = a\cos(t), y = \sin(t)$. Using an integral to prove that your formula is correct.

S3. Find the area of the region bounded by the x-axis and the parametric curve given by $x = 1 + e^t, y = t - t^2$. (*Hint:* after setting up the integral, you might want to consider integration by parts.)

S4. Find the length of one arch of the cycloid given in S1.

S5. Find the arc length of the curve given by $x = 1 + 3t^2, y = 4 + 2t^3$ on $[0, 1]$.

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