

HOW LONG IS A PARABOLA?

1. The goal of this worksheet is to determine the arc length of a segment of the parabola $y = x^2$.
 - a) Set up an integral giving the arc length of $y = x^2$ from 0 to 1. For now we'll ignore the limits of integration, so you can leave them off for steps b through e.
 - b) Make a trigonometric substitution to convert to a trig integral.
 - c) Use integration by parts.
 - d) Use a trig identity to cycle back to the starting integral and then solve for the integral (like problem 1 of the last worksheet).
 - e) Convert back to x using a triangle.
 - f) Now use the original limits of integration to find the arc length of $y = x^2$ from 0 to 1.

Challenge. Verify that your antiderivative for $\sqrt{1 + 4x^2}$ is correct.

Challenge. Find an arc length function $s(x)$ for the parabola $y = x^2$.