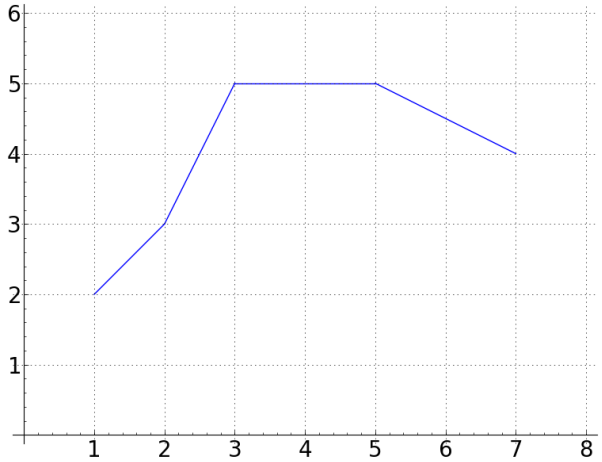
§6.5 - Arclength

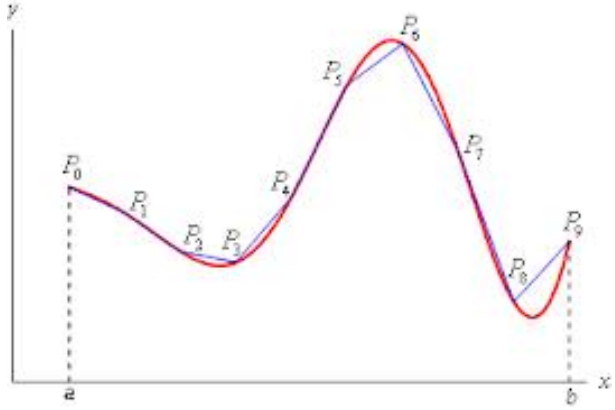
After completing this section, students should be able to:

- Explain the relationship between the formula for arc length and the distance formula.
- Calculate the arclength of a curve of the form $y = f(x)$.

Example. Find the length of this curve.

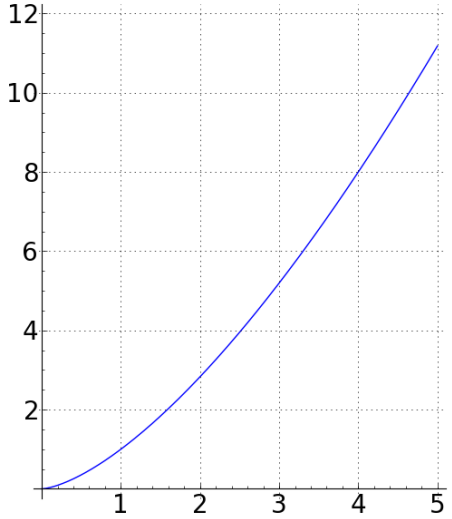


Note. In general, it is possible to approximate the length of a curve $y = f(x)$ between $x = a$ and $x = b$ by dividing it up into n small pieces and approximate each curved piece with a line segment.



Arclength is given by the formula:

Example. Find the arclength of $y = x^{3/2}$ between $x = 1$ and $x = 4$.



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Review. For a curve $y = f(x)$, the arclength of the curve between $x = a$ and $x = b$ is given by the formula:

Example. Set up an integral to calculate the arc length of the curve $y = \sqrt{x}$ between $x = 0$ and $x = 3$.

Example. Find a function $a(t)$ that gives the length of the curve $y = \frac{e^x + e^{-x}}{2}$ between $x = 0$ and $x = t$.

Note. Although arc length integrals are usually straightforward to set up, the square root sign makes them notoriously difficult to evaluate, and sometimes impossible to evaluate.