- Area under a curve $f(x): A = \left| \int_a^b f(x)dx \right|$
- Area between two curves $f(x)$ and $g(x): A = \left| \int_a^b [f(x) - g(x)]dx \right|$
- Arc Length:
  - Derived from Pythagorean theorem for a infinitely small piece of the curve: $ds^2 = dx^2 + dy^2$. Because this piece is very small, linear approximation is a good approximation.
  - $s = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$ OR similarly $s = \int_a^b \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$
  - For a parameterized curve $\vec{r}(t) = \langle x(t), y(t) \rangle$, arc length can also be written as $s = \int_{t_1}^{t_2} |\vec{r}(t)| dt = \int_{t_1}^{t_2} \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$
- Area of a Surface of Revolution
  - Integrate the slice of the outer surface of a cone
  - $S = 2\pi \int_a^b r(x) \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$ OR $S = 2\pi \int_a^b r(y) \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$
  - $r(x)$ is the radius function of the surface.