Activity - Length of a Curve

Each of the following questions somehow involves the arc length along a curve.

(a) Use the definition and appropriate computational technology to determine the arc length along $y = x^2$ from $x = -1$ to $x = 1$.

(b) Find the arc length of $y = \sqrt{4 - x^2}$ on the interval $-2 \leq x \leq 2$. Find this value in two different ways: (a) by using a definite integral, and (b) by using a familiar property of the curve.

(c) Determine the arc length of $y = xe^{3x}$ on the interval $[0,1]$.

(d) Will the integrals that arise calculating arc length typically be ones that we can evaluate exactly using the First FTC, or ones that we need to approximate? Why?