Peer Questions for Section 7.4

In your group (minimum of two people per), discuss your responses to the following questions.
Rotate (again) the role of ”group scribe”, a person who should submit your group’s responses, using the web form below, by 5 pm, Wed., Sept. 25.

1. Write down what the integrand should be in order that the corresponding integral from \( a \) to \( b \) would give the length of the corresponding arc on the curve. (You do not need to compute that arc length.)
   (a) \( y = \sin x \), in the interval \( 0 \leq x \leq \pi \)
   (b) \( f(x) = 2 + 3x - \frac{1}{4}x^2 \), from the origin to the vertex of the parabola
   (c) \( y^2 - x^4 = 3 \), on the lower branch of the curve, with \( 1 \leq x \leq 5 \)

2. What are the limits of integration for part (b) of the last problem?

3. If the length of an arc \( y = f(x), a \leq x \leq b \), is needed for an arbitrary function \( f \), you will likely find yourself using a numerical method like Simpson’s rule to obtain it. This is because the integrand \( \sqrt{1 + [f'(x)]^2} \) does not often have a nice antiderivative, one found via integration techniques we have learned. See if you can find two different functions \( f \) (make their formulas as different and as non-trivial as you can) for which the resulting arc length integral is one that can be evaluated via the Fundamental Theorem of Calculus Part II.

4. Identify one item (a concept, a step in an example, a statement, etc.) from this reading assignment you found difficult or confusing.