Part 1 – Numerically and Graphically Investigate Integral

Let $F(x) = \int_a^x f(x)dx$.

1. Animate the *x* on page 1.4 by pressing the play button (►) to observe when *F*(*x*) is increasing and decreasing. Describe *f*(*x*) when *F*(*x*) is increasing.

2. If $f(x) = \sin(x)$, $a = \frac{\pi}{2}$, fill in the table for the given values of *x*.

x	$-\frac{\pi}{2}$	0	$\frac{\pi}{2}$	π	$\frac{3\pi}{2}$	2π
F(x)						

3. What function fits these values?

4. Grab and move point *a*. Observations the effects of *F*(*x*). Record these observations. Also if *a* and *x* are the limits of integration, is the integral negative when *x* < *a*?

5. $\int_{\pi}^{\pi/2} \sin(x)dx =$ _____

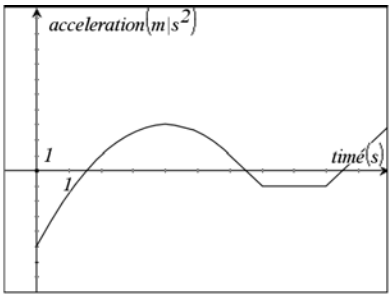
6. On page 2.2, press **MENU > Trace > Graph Trace**. Click the point (*x*, *area*) one time. When you press play there will be a trail of points left behind the animated point. These points are points on *F*(*x*) where $F(x) = \int_a^x f(x)dx$. What is the amplitude of the integral of 1.5cos(2*x*)?

7. Describe your observations when you change the value of *a*. How does changing the value of *a* effect *F*(*x*)?

8. The graph of the integral is increasing when the function (the integrand) is what?

Part 2 – Curve Sketching and Kinematic Calculus

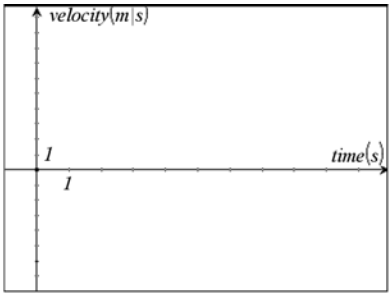
On the following graphs, sketch the corresponding kinematic graph. Make your prediction before revealing and confirming your solution.



1. **a.** What is the definite integral of acceleration with respect to time?

b. The definite integral of velocity is _____

2. Describe what is physically occurring in this graph.



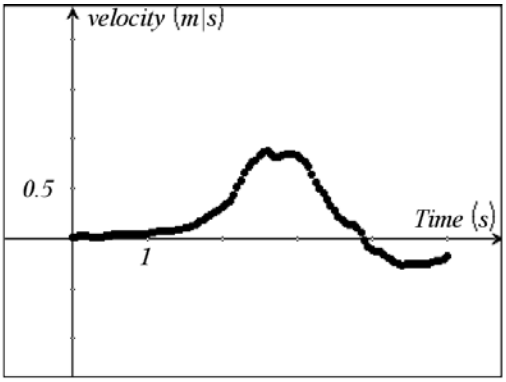
3. The integral of a parabola is _____

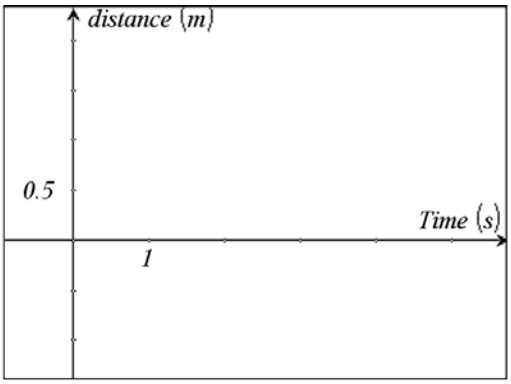
The integral of a constant function is _____

The integral of an oblique line is _____

4. Predict the approximate final position for the two graphs below. Note the left graph has an initial position of 0.5 m and the right is at 1.5 m with t = 0 s.

a.





b.