

FUNdamental:

Getting Started:

It is easy to get started with *FUNdamental*. In the *Control* window, select a function from one of the three menus labeled: *Easy*, *Medium*, and *Hard*. A window labeled *FUN* will come up if it is not up already. If the button labeled *Demonstration* has a check on it, you will see a demonstration in the *FUN* window.

The Area Animation:

The function $f(x)$ is displayed in the upper graph. As the vertical hairline moves from left to right, the net size of the shaded area under $f(x)$ from $x = 0$ to $x = t$ is calculated and plotted in the bottom window at the corresponding point. $F(t)$ will denote the shaded area under $f(x)$ from $x = 0$ to $x = t$.

Recall that if the function $f(x)$ is integrated from a to t the area under the function $f(x)$ from a to t , or $F(t)$ is calculated.

Note that areas above the x -axis possess positive area and those below the x -axis possess negative area.

Playing The Game:

Once the demo has been played, the graph of $F(t)$, the area under $f(x)$ from $x = 0$ to $x = t$ remains in the bottom view and the graph of $f(x)$ is erased.

Estimate the rate at which the area, $F(t)$, changes with respect to a change in

time and plot that change in the top view by clicking the mouse at the appropriate location. Simply choose an interval, say $[1.0, 1.5]$, move the upper slider to 1.0 and the lower slider to 1.5, estimate how much area was accumulated under the function $f(x)$ from $x = 1.0$ to $x = 1.5$. Suppose the area is 2.5 square units, $F(1.5) - F(1.0) = 2.5$. This forms an estimate of the rate of change in the area, an increase of 2.5 units of area per .5 units increase in x or rate of change of area of 5 units of area for a unit change in the x coordinate. Click the mouse in the top graph at $(1.25, 5)$ to get a point at that location.

Turn on the midpoint line for the second graph to place a dark gray line at the point which lies half-way between the interval end points designated by the sliders. This should help in the midpoint estimation.

Place as many points as desired. When done placing points, click on the button labeled *Done* and the score will be displayed in the text field labeled *Score*.

Hints:

Turn on hints by clicking on the button labeled *Hints* with the ☐ so that it displays a check mark. Hints are not meant to be perfect, but are there to give an idea of accuracy. When hints are activated, they will display the x and y coordinates of the point clicked on, a hint telling how close the point is, and a statement indicating if this guess was closer than the last guess.

Scoring:

The score is based on the absolute y distance between the placed points and the actual function. This is divided by the number of points placed and by the width of the current graph. Placing just a few points very accurately will not generate a high score. Try to spread points out across the graph.