DOOR ANGLE AS A FUNCTION OF TIME

Q1 The angle increases from $t = 0$ to approximately $t = 1.45$. You can tell because the maximum value of the angle occurs at approximately $t = 1.45$.

Q2 The maximum angle is approximately 106°, at $t = 1.45$.

THE DOOR AT TWO DIFFERENT TIMES

Q3 The slider has a maximum value of 1. The smallest separation you can observe on the graph is about 0.01. The slider uses a logarithmic scale, so it's easy to achieve very small values—values that are much smaller than you can observe on the graph.

Q4 Yes, the displayed values (to five decimal digits) continue to show the changes.

THE RATE OF CHANGE OF THE DOOR'S ANGLE

Q5 The units are degrees/s. The rate of change tells you by how many degrees the door is opening or closing for every second.

Q6 The rate of change is the slope of the dotted secant line. As the secant line approaches tangency, the calculated rate of change approaches the instantaneous rate of change.

Q7 When the rate of change is positive, the door is opening; when the rate is negative, the door is closing. When the rate of change is close to zero, the door is moving slowly; when the absolute value of the rate of change is large, the door is moving quickly.

Q8 When $t_1 = 1$ and $\Delta t = 0.1$, the calculated rate of change is 26.33629 degrees/s.

THE LIMIT OF THE RATE OF CHANGE

Q9 The average rate of change is higher (more than 30 degrees/s) and appears to be a more accurate value for $t_1 = 1.0$.

Q10 The rate of change appears to approach a limit; the differences are less and less. The rate of change seems to be approaching 30.685 degrees/s.

Q11 No, the change is too small to observe on the graph.

Q12 The derivative (that is, the limit of the rate of change) when t_1 is 3 seconds seems to be about -26.986 degrees/s. The negative sign means that the door is closing.