## M3.6 – Draw and use the slope of a tangent to a curve as a measure of rate of change

## Teacher answers

### Quiz

This graph shows concentration of maltose produced over time for an enzyme-controlled reaction. Find the rate of maltose production at 2 min.



The graph is curved so we need to draw a tangent line to the curve at the point for 2 minutes to approximate the gradient.



Using this tangent line we can use the formula gradient equals the change in y divided by the change in x (or rise over run) between 2 points.

$$Gradient=\frac{'change in y'}{'change in x'} $$

Using the points (1,33) and (3.3, 80) we get a change in y (“rise”) of 80 – 33 = 47, and a change in x (“run”) of 3.3 – 1 = 2.3. So the gradient and thus the rate of reaction at 2 minutes is 47 divided by 2.3 which equals 20.4 mmol dm-3 min -1.

Change in y: 80 – 33 = 47

Change in x: 3.3 – 1 = 2.3

The rate of reaction (gradient) at 2 minutes: $\frac{47}{2.3}$ = 20.4 mmol dm-3 min-1

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