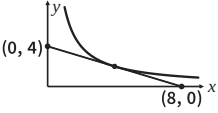
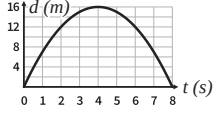
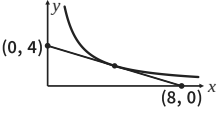
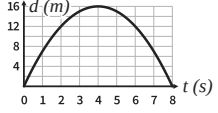


## Rates of Change on Curves *ramp up*

|                                                                                                                                    |                                                                                                                   |                                                                                                                                        |                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>a</b> Find the tangent's gradient<br><br><hr/> | <b>b</b> Find the point on $y = -x^2 + 6x$ where the gradient is 0<br><br><hr/>                                   | <b>c</b> When is the object stationary?<br><br><hr/> | <b>d</b> $y = x^2$ . Use the chord from $x = 2.9$ to $x = 3.1$ to estimate the gradient at $x = 3$<br><br><hr/> |
| <b>e</b> $y = x^2$ . Find the average rate of change from $x = a$ to $x = a + 2$ in terms of $a$<br><br><hr/>                      | <b>f</b> $y = x^2 + 3x$ . Find the gradient of the chord from $x = 2$ to $x = 2 + h$ in terms of $h$<br><br><hr/> | <b>g</b> A chord from $x = 1$ to $1 + h$ has gradient $5 + 2h$ . Find the gradient at $x = 1$ .<br><br><hr/>                           | <b>h</b> $y = x^2$ . The tangent at $(3, 9)$ has gradient 6. Find its $x$ intercept.<br><br><hr/>               |
| <b>i</b> The average rate of change of $y = x^2 + bx$ from $x = 0$ to $x = 4$ is 1. Find $b$ .<br><br><hr/>                        | <b>j</b> $y = 3^x$ . From $x = 0$ to $x = k$ the average rate is 4. Find $k$ .<br><br><hr/>                       | <b>k</b> Show the chord of $y = x^2$ from $x = a$ to $x = b$ has gradient $a + b$<br><br><hr/>                                         | <b>l</b> $y = \frac{1}{x}$ . Show the chord from $x = a$ to $x = b$ has gradient $-\frac{1}{ab}$<br><br><hr/>   |

The Maths Habit

## Rates of Change on Curves *ramp up*

|                                                                                                                                      |                                                                                                                   |                                                                                                                                          |                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>a</b> Find the tangent's gradient<br><br><hr/> | <b>b</b> Find the point on $y = -x^2 + 6x$ where the gradient is 0<br><br><hr/>                                   | <b>c</b> When is the object stationary?<br><br><hr/> | <b>d</b> $y = x^2$ . Use the chord from $x = 2.9$ to $x = 3.1$ to estimate the gradient at $x = 3$<br><br><hr/> |
| <b>e</b> $y = x^2$ . Find the average rate of change from $x = a$ to $x = a + 2$ in terms of $a$<br><br><hr/>                        | <b>f</b> $y = x^2 + 3x$ . Find the gradient of the chord from $x = 2$ to $x = 2 + h$ in terms of $h$<br><br><hr/> | <b>g</b> A chord from $x = 1$ to $1 + h$ has gradient $5 + 2h$ . Find the gradient at $x = 1$ .<br><br><hr/>                             | <b>h</b> $y = x^2$ . The tangent at $(3, 9)$ has gradient 6. Find its $x$ intercept.<br><br><hr/>               |
| <b>i</b> The average rate of change of $y = x^2 + bx$ from $x = 0$ to $x = 4$ is 1. Find $b$ .<br><br><hr/>                          | <b>j</b> $y = 3^x$ . From $x = 0$ to $x = k$ the average rate is 4. Find $k$ .<br><br><hr/>                       | <b>k</b> Show the chord of $y = x^2$ from $x = a$ to $x = b$ has gradient $a + b$<br><br><hr/>                                           | <b>l</b> $y = \frac{1}{x}$ . Show the chord from $x = a$ to $x = b$ has gradient $-\frac{1}{ab}$<br><br><hr/>   |

The Maths Habit