# Diff and rates of change

1) Given that $y = (x - 5)\sqrt{2x+5}$,

**(i)** show that $\frac{dy}{dx}$ can be written in the form $\frac{kx}{\sqrt{2x+5}}$ and state the value of $k$, [4]

**(ii)** find the approximate change in $y$ as $x$ decreases from 10 to $10 - p$, where $p$ is small, [2]

**(iii)** find the rate of change of $x$ when $x = 10$, if $y$ is changing at the rate of 3 units per second at this instant. [2]

2) A curve has the equation $y = \frac{2x+4}{x-2}$.

**(i)** Find the value of $k$ for which $\frac{dy}{dx} = \frac{k}{(x-2)^2}$. [2]

**(ii)** Find the equation of the normal to the curve at the point where the curve crosses the $x$-axis. [4]

A point $(x, y)$ moves along the curve in such a way that the $x$-coordinate of the point is increasing at a constant rate of 0.05 units per second.

**(iii)** Find the corresponding rate of change of the $y$-coordinate at the instant that $y = 6$. [3]

3) It is given that $y = (x + 1)(2x - 3)^{3/2}$.

**(i)** Show that $\frac{dy}{dx}$ can be written in the form $kx\sqrt{2x-3}$ and state the value of $k$. [4]

Hence

**(ii)** find, in terms of $p$, an approximate value of $y$ when $x = 6 + p$, where $p$ is small, [3]

4) A curve has the equation $y = \frac{8}{2x-1}$.

**(i)** Find an expression for $\frac{dy}{dx}$. [3]

**(ii)** Given that $y$ is increasing at a rate of 0.2 units per second when $x = -0.5$, find the corresponding rate of change of $x$. [2]

5) Two variables, $x$ and $y$, are related by the equation

$$y = 6x^2 + \frac{32}{x^3}.$$

**(i)** Obtain an expression for $\frac{dy}{dx}$. [2]

**(ii)** Use your expression to find the approximate change in the value of $y$ when $x$ increases from 2 to 2.04. [3]