

Want more revision exercises? Get [MathsFit](#) - New from projectmaths.

<b>10</b>	<b>8d</b>	Let $f(x) = x^3 - 3x^2 + kx + 8$ , where $k$ is a constant. Find the values of $k$ for which $f(x)$ is an increasing function.	<b>2</b>
$f(x) = x^3 - 3x^2 + kx + 8$ $f'(x) = 3x^2 - 6x + k$ <p>If <math>f(x)</math> is increasing function, then <math>f'(x) &gt; 0</math>:</p> <p>Hence, find value of <math>k</math> where <math>3x^2 - 6x + k</math> is positive definite.</p> $\Delta = b^2 - 4ac < 0 \text{ and } a > 0$ $= (-6)^2 - 4(3)(k) < 0$ $36 - 12k < 0$ $\therefore 12k > 36$ $k > 3 \quad [\text{also, } a = 3 > 0]$ <p><math>\therefore</math> increasing when <math>k &gt; 3</math></p>			State Mean: <b>0.55/2</b>

\* These solutions have been provided by [projectmaths](#) and are not supplied or endorsed by the Board of Studies

### Board of Studies: Notes from the Marking Centre

Most candidates correctly differentiated the function and realised that  $f'(x) > 0$  (for all  $x$ ) for an increasing function. Significantly, many were then unable to (correctly) determine the value of  $k$  for which this occurred.

A substantial number of candidates assumed that increasing meant either  $f(x) > 0$  or  $f''(x) > 0$ .

It is important to note that many candidates could not successfully solve  $36 - 12k < 0$ , not being able to deal with the required sign change. Some candidates used an alternative approach to the solution by looking at completing the square; others by graphical means.

Source: [http://www.boardofstudies.nsw.edu.au/hsc\\_exams/](http://www.boardofstudies.nsw.edu.au/hsc_exams/)