13a)i) -2

1	-2	-20	-24
	-2	8	24
1	-4	-12	$\underline{0}$

remainder $=0$ so $(x+2)$ is a factor

ii) $(x+2)(x^2-4x-12)$

$x=-2$ $(x-6)(x+2)$

$x=6$ $x=-2$

b) $x=-2$ is root and s.p. for $f(x)$

moves to $(1,0)$ which is $\rightarrow 3$

$k=3$

Question			Generic Scheme	Illustrative Scheme	Max Mark
13.	(a)	(i)	$\bullet^1$ use -2 in synthetic division or evaluation of the cubic	$\bullet^1$ $-2 \mid 1 \quad -2 \quad -20 \quad -24$ $\quad\quad\quad\quad\quad\quad$ $\quad\quad\quad 1$ or $(-2)^3 - 2(-2)^2 - 20(-2) - 24$	**2**
			$\bullet^2$ complete division/evaluation and interpret result	$\bullet^2$ $-2 \mid 1 \quad -2 \quad -20 \quad -24$ $\quad\quad\quad\quad -2 \quad 8 \quad 24$ $\quad\quad\quad 1 \quad -4 \quad -12 \mid 0$ Remainder $= 0 \therefore (x+2)$ is a factor or $f(-2) = 0 \therefore (x+2)$ is a factor	
		(ii)	$\bullet^3$ state quadratic factor	$\bullet^3$ $x^2 - 4x - 12$	**3**
			$\bullet^4$ find remaining factors or apply the quadratic formula	$\bullet^4$ $(x+2)$ and $(x-6)$ or $\dfrac{4 \pm \sqrt{(-4)^2 - 4(1)(-12)}}{2(1)}$	
			$\bullet^5$ state solution	$\bullet^5$ $-2, 6$	

Notes:

1. Communication at $\bullet^2$ must be consistent with working at that stage - a candidate's working must arrive legitimately at 0 before $\bullet^2$ can be awarded.
2. Accept any of the following for $\bullet^2$:
   - '$f(-2) = 0$ so $(x+2)$ is a factor'
   - 'since remainder $= 0$, it is a factor'
   - the '0' from any method linked to the word 'factor' by 'so', 'hence', $\therefore, \rightarrow, \Rightarrow$ etc.
3. Do not accept any of the following for $\bullet^2$:
   - double underlining the '0' or boxing the '0' without comment
   - '$x = -2$ is a factor', '... is a root'
   - the word 'factor' only, with no link.

Commonly Observed Responses:

	(b)		$\bullet^6$ state value of k	$\bullet^6$ 3	**1**

Notes:

1. Accept $y = f(x-3)$ or $f(x-3)$ for $\bullet^6$.

Commonly Observed Responses: