5	**(i)**		$h=2$	**B1**	**1.1**	E		
			$\frac{h}{2}\left[\frac{1}{2}+\frac{1}{4}+2\left(\frac{1}{2+\sqrt{2}}\right)\right]$	**M1**	**2.1**	E	Use of correct formula with correct (exact) *y*-values with their *h*	Condone one error in values
			$I\approx\frac{3}{4}+\frac{2}{2+\sqrt{2}}$	**A1**	**1.1**	C		
			$\frac{1}{2+\sqrt{2}}=\frac{\left(2-\sqrt{2}\right)}{\left(2+\sqrt{2}\right)\left(2-\sqrt{2}\right)}=\frac{2-\sqrt{2}}{2}$	**M1**	**3.1a**	E	Correct method for rationalising the denominator of their surd together with correct simplification	
			$I\approx\frac{3}{4}+\left(2-\sqrt{2}\right)=\frac{11}{4}-\sqrt{2}$	**A1** **[5]**	**2.2a**	A	**AG** – at least one step of intermediate working (from application of trapezium rule to given result)	Must be convincing as AG

Question			Answer	Marks	AO		Guidance	
5	(ii)		$x=u^2 \Rightarrow \mathrm{d}x = 2u\,\mathrm{d}u$	**M1***	**3.1a**	E	An attempt at integration by sub - allow any genuine attempt (as a minimum must differentiate their sub. and remove all x's)	Limits not required for first four marks
			$\int_0^4 \frac{\mathrm{d}x}{2+\sqrt{x}} = \int_0^2 \frac{2u}{2+u}\mathrm{d}u$	**A1**	**1.1**	C	Correct integral in terms of u	
			$=2\int_0^2 \frac{2+u-2}{2+u}\mathrm{d}u = 2\int_0^2 1-\frac{2}{2+u}\mathrm{d}u$	**Dep*M1**	**2.1**	C	Re-writes integral in the form $\int a+\frac{b}{1+u}\mathrm{d}u$	Or use $t=2+u$ to obtain integral of the form $\int a+\frac{b}{t}\mathrm{d}t$
			$=2\left[u-2\ln(2+u)\right]_0^2$	**A1ft**	**1.1**	A	Correctly integrates their $\int a+\frac{b}{1+u}\mathrm{d}u$	$\int 2-\frac{4}{t}\mathrm{d}t$ $=2t-4\ln t$
			$=2\left\{(2-2\ln(2+2))-(0-2\ln(2+0))\right\}$	**M1**	**1.1**	C	Uses correct limits correctly (dependent on both previous M marks)	
			$=2(2-2\ln 2)$	**A1** **[6]**	**2.2a**	A	oe e.g. 4 – 4 ln 4 + 4 ln 2	
5	(iii)		$\frac{11}{4}-\sqrt{2} \approx 2(2-2\ln 2)$	**M1**	**1.1a**	C	Setting the given result approx. equal to their (ii)	
			$\ln 2 \approx \frac{5}{16}+\frac{\sqrt{2}}{4}$	**A1** **[2]**	**2.2a**	A	$k=\frac{5}{16}$	