

Question			Answer	Marks	AO	Guidance	
10	(a)		$\frac{d}{dx}(e^{x^2}) = 2xe^{x^2}$ Quotient rule $u = e^{x^2}$ and $v = x + 1$ $\frac{dy}{dx} = \frac{2xe^{x^2}(x+1) - 1 \times e^{x^2}}{(x+1)^2}$ $= \frac{e^{x^2}(2x^2 + 2x - 1)}{(x+1)^2}$	B1 M1 A1 [3]	1.1 1.1 1.1	Correct derivative of e^{x^2} seen Uses quotient rule with their $\frac{du}{dx}$ and $\frac{dv}{dx}$ oe Fully correct. Any form	 Also allow use of the product rule with $(x+1)^{-1}$ giving $\frac{dy}{dx} = \frac{2xe^{x^2}}{x+1} - \frac{e^{x^2}}{(x+1)^2}$
10	(b)		Negative when $2x^2 + 2x - 1 < 0$ as the denominator and e^{x^2} are always positive So $-1 < x < \frac{-1+\sqrt{3}}{2}$	M1 B1 A1 [3]	2.1 1.1a 2.5	Simplifies the problem to a quadratic inequality FT their $\frac{dy}{dx}$ Also allow for algebraic attempt to find the stationary point if used to define a range of values $\frac{-1+\sqrt{3}}{2}$ or 0.366 seen oe $-1 < x < 0.366 \dots$	Allow if their $\frac{dy}{dx}$ leads to linear or cubic inequality Do not allow for $\leq$ used in final answer

10	(c)	$f(0) + 2(f(0.25) + f(0.5) + f(0.75)) + f(1)$ $[= 7.78014 \dots]$ $\text{Area} \approx \frac{1}{2} \times 0.25 \times 7.78014 \dots$ $= 0.9725 \dots$	M1 B1 A1 [3]	1.1 1.1 1.1	Uses 5 values in an attempt to find the total for trapezium rule with correct x -values soi Also allow for the total area of four trapeziums attempted $\frac{h}{2} = \frac{0.25}{2}$ or 0.125 soi	See table below for values
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x	0	0.25	0.5	0.75	1
f(x)	1	0.851596	0.856017	1.002888	1.359141
contribution	1	1.703191	1.712034	2.005777	1.359141

10	(d)		Trapezium rule gives an over-estimate because the curve is concave upwards (or convex downwards, or gradient increasing)	B1 [1]	2.4	Also allow an explanation that involves extra area under the line that is not in the region. Condone incorrect description of the curve, if the explanation of additional area is clear. See appendix	Allow for comparing exact value of area found BC to their estimate and stating over-estimate
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Exemplar responses for Q10(d)

Response	Mark
Overestimate because the curve is convex/concave	B0
Overestimate because the trapeziums would go over the curve line	B1
Overestimate because there are gaps between the trapeziums and the graph	B0