

Y	Q	Integration	
2022	7	Use integration by parts to find $\int 18x \sin 3x \, dx$.	3
2019	8	A particle, starting from rest, moves with an acceleration of $2t\sqrt{2t+1} \text{ ms}^{-2}$, where t is the time in seconds. Use integration by parts, or otherwise, to determine the velocity of the particle after 4 seconds.	5
2019	17	(a) Find $\int e^t \sec^2(e^t) dt$ (b) Given your answer describes the displacement of a particle, explain why the particle will never come to rest.	1 2
2018	2	(a) Find partial fractions for $\frac{13+6x+5x^2}{(1+x)(2-x)(3+x)}$ (b) Show that $\int_0^1 \frac{13+6x+5x^2}{(1+x)(2-x)(3+x)} dx = \ln \frac{a}{b}$ where a and b are positive integers.	4 3
2018	13	Find the exact value of the integral $\int_0^{\sqrt{5}} \frac{2x^3}{\sqrt{x^2+4}} dx$ using the substitution $u = x^2 + 4$.	6
2017	10	Use integration by parts to obtain $\int x^2 \sin 5x \, dx$.	5
2017	15	A car of mass m kg is travelling along a straight horizontal road. It experiences resistances of total magnitude $\frac{mkv^2}{6}$, where $v \text{ m s}^{-1}$ is its velocity at any time and k is a positive constant. The engine of the car works at a constant rate P watts. (a) Show that $\frac{dv}{dx} = \frac{6P - mkv^3}{6mv^2}$ where x metres is the displacement of the car from a fixed point O. (b) If the car starts from rest, find an expression, in terms of k , P , m and v , for the displacement of the car while it is accelerating.	2 4
2016 Spec	10	Find the exact value of $\int_2^7 \frac{x}{\sqrt{x+2}} dx$ using the substitution $u = x+2$.	5