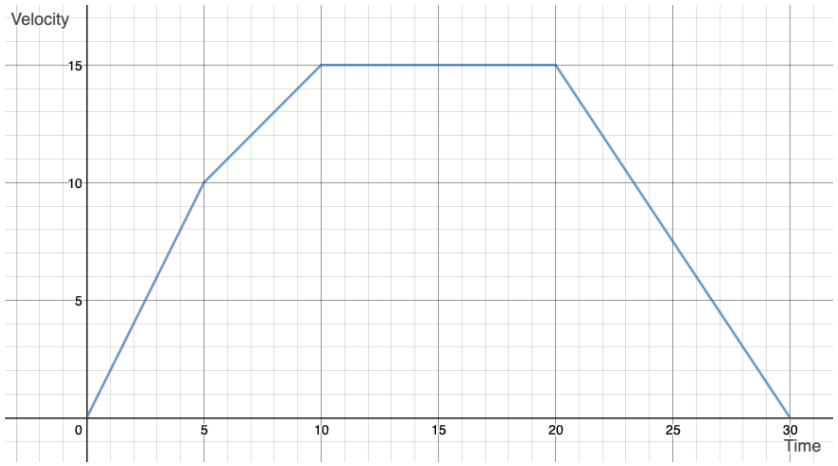
AQA A-Level Mathematics Warmup - Paper 2 2019

Find the binomial expansion of $\sqrt[3]{8+2x}$	Sketch $y = \ln(3x+2)$	A ball is dropped from a balcony 4.3 m off the ground. How long does it take for the ball to reach the ground?	By differentiating $\tan(y) = 3x$ implicitly find the derivative of $\arctan(3x)$	The velocity of a model boat is given by the vector $\mathbf{v} = 3\mathbf{i} + 4\mathbf{j}$. Find the magnitude and direction fo the velocity.
Define the moment of a force F from a point A	Find the area enclosed by the $x-$axis, $y-$axis and the functions $y = x^2 + 1$ and $y = -x + 3$.	Find $\sin(105°)$	A box of mass 1 kg is being pulled across a smooth floor by a rope inclined at $30°$ to the horizontal. The tension in the rope is 8 N a) Draw a labelled force diagram. b) Find the acceleration of the box. c) State a modelling assumption made about the box.	
A curve is given by the parametric equations $x = 4t^2 + 1, y = t^3 - 1$. Find where the curve crosses the $x-$axis.	$(x-3)$ is a factor of $x^3 + ax^2 - 10x - 24$. Find the value of a.	In projectile motion what happens to the horizontal component of the velocity?	Find $\int e^{3x}\cos(3x)\mathrm{d}x$	The distance travelled by a car, s, in metres is given by $s = 3t^2 + \frac{3}{2}t^3$. Find the speed when $t = 2$
	For the velocity time graph to the left: a) Describe the motion shown, identifying all key features. b) For what time interval is the acceleration greatest? And what is it? c) What is the total distance travelled?		How would you determine if a function $f(x) = 0$ has a sign change in the interval $[a, b]$? What could go wrong with this?	State Newton's 3 laws of motion.
			What is limiting friction?	Sketch $y = \lvert x^2 - x - 12 \rvert$

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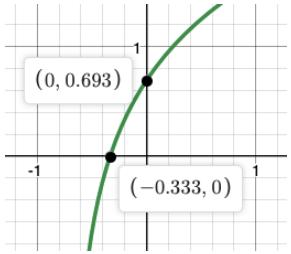
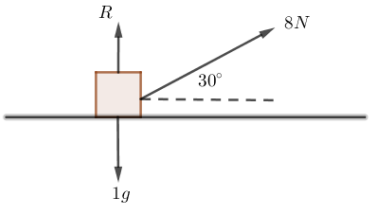
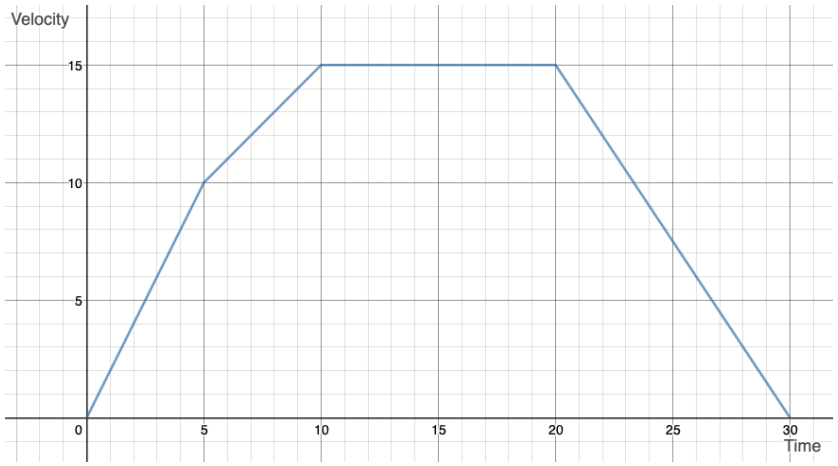
$2+\frac{x}{6}-\frac{x^2}{72}+\frac{5x^3}{2592}-\cdots$		$\sqrt{\frac{43}{49}}$s ≈ 0.88s	$\frac{dy}{dx}=\frac{3}{9x^2+1}$	$\lvert\mathbf{v}\rvert = 5$, at an angle $53.1°$ to the positive $\mathbf{i}$ direction.
The force multiplied by the perpendicular distance from the force's line of action to the point A.	$\frac{10}{3}$	$\frac{1+\sqrt{3}}{2\sqrt{2}}$		b) $4\sqrt{3}$ ms^{-1} b) We have modelled the box as a particle.
$(1,0)$ and $(5,0)$	$a = 3$	It stays constant.	$\frac{1}{6}e^{3x}\left(\sin(3x)+\cos(3x)\right)$	30 ms^{-1}
		a) Accelerating between 0 and 5 seconds, still accelerating but at a slower rate between 5 and 10 seconds. Travelling at a constant speed between 10 and 20 seconds and then decelerating between 20 and 30 seconds. b) Between 0 and 5 seconds. c) 312.5 units.	Look for a sign change between $f(a)$ and $f(b)$. This may fail to work if there are in fact multiple roots in the interval. Limiting friction is when friction is at its maximum. Then $F=\mu R$ where R is the reaction force.	NL1: A body will stay at rest, or maintain a constant velocity unless acted upon by a force. NL2: The overall resultant force is equal to the mass times the acceleration of a body. NL3: When one body exerts a force on a second body, the second body simultaneously exerts a force of equal magnitude and opposite direction on the first body.