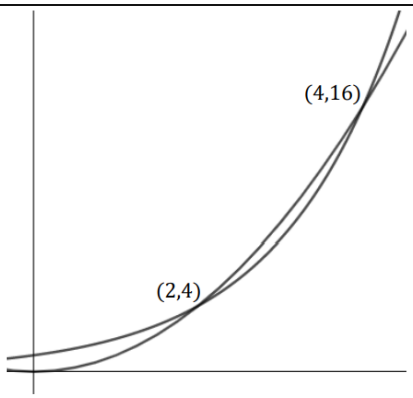
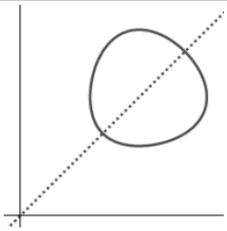
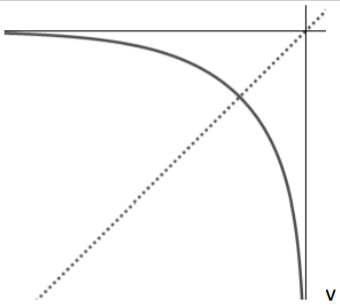
STEP II, 2020, Q2 MS

2(i)	$\frac{1-ky}{y}\frac{dy}{dx}=\frac{kx-1}{x}$
	$\ln\lvert y\rvert - ky = kx - \ln\lvert x\rvert + c$
	Hence, $\ln\lvert xy\rvert = k(x+y)+c$
	$xy=\frac{1}{4}\left[(x+y)^2-(x-y)^2\right]=Ae^{k(x+y)}$
	C_1 is $(x-y)^2=(x+y)^2-2^{x+y}$
	C_2 is $(x-y)^2=(x+y)^2-2^{x+y+4}$
	In both cases, the equation is invariant under $(x,y)\mapsto(y,x)$, so symmetrical in $y=x$.
2(ii)	
	Graphs: Correct shapes of curves
	Graphs: Intersections at (2,4) and (4,16)
	$(x-y)^2\geq 0$, so $(x+y)^2>2^{x+y}$
	Therefore, $(x+y)$ must lie between 2 and 4
	
	Graph: Symmetry about $y=x$
	Graph: Closed curve lying between $x+y=3\pm1$
	Graph: Passes through (1,1) and (2,2)

2(iii)	Sketches of $y = x^2$ and $y = 2^{x+4}$ $x^2 > 2^{x+4}$ only when $x < -2$.
	
	Graph: Symmetry about $y = x$
	Graph: Passes through (-1,-1)
	Graph: $y \to 0$ as $x \to \infty$, $y \to -\infty$ as $x \to 0$