Vector calculus 2016–17 — Solutions to previous exams

These are the results of the questions appeared in previous vector calculus exams, which are available on the course web page. They are provided to double check the solutions you found in your revision. Note that these are only the final values, in a real exam you obtain almost all the points for the solution procedure, not for the final results! Where you read "proof", the corresponding question required a proof which is not reported here. For the questions of the type "demonstrate the identity. . .", we give here the results you should get for both the left- and the right-hand side of the identity. Note that the notation used in previous years might be slightly different from that you are used to; for example, in older exams double and triple integrals were denoted with a single integral sign.

Exam	Question	Final result
MA2VC 2011-12	1a	proof
	1b	$xz^2\mathrm{e}^{xy}\hat{\boldsymbol{\imath}} - yz^2\mathrm{e}^{xy}\hat{\boldsymbol{\jmath}} + (x + y + xy^2 + yx^2)\mathrm{e}^{xy}\hat{\boldsymbol{k}}$
	2a	proof
	2b	$1/3$
MA3VC 2011-12	1a	proof
	1b	$xz^2\mathrm{e}^{xy}\hat{\boldsymbol{\imath}} - yz^2\mathrm{e}^{xy}\hat{\boldsymbol{\jmath}} + (x + y + xy^2 + yx^2)\mathrm{e}^{xy}\hat{\boldsymbol{k}}$
	1c	proof
	2a	proof
	2b	$2/3$
MA2VC 2012-13	1a	proof
	1b	$x\hat{\boldsymbol{\imath}} - y\hat{\boldsymbol{\jmath}} + (y - x)\hat{\boldsymbol{k}}$
	2a	7
	2b	$\phi = xyz + c$
	3	proof
	4	$\frac{1}{2}(\hat{\boldsymbol{\imath}} + \hat{\boldsymbol{\jmath}})$
MA3VC 2012-13	1a	proof
	1b	$-2\hat{\boldsymbol{\imath}} - 2\hat{\boldsymbol{k}}$
	2	$\pi/2$
	3a	proof
	3b	proof
	4	$\frac{1}{2}(\hat{\boldsymbol{\imath}} - \hat{\boldsymbol{\jmath}})$
MA2VC 2013-14	1a	proof
	1b	first term is $-4x\cos 2z\,\hat{\boldsymbol{\jmath}}$
	1c	proof
	2	$7/2$
	3	$5/3$
	4	proof
MA3VC 2013-14	1a	proof
	1b	first term is $6x^2y^2\cos 2z\hat{\boldsymbol{\imath}} - 4xy^3\cos 2z\hat{\boldsymbol{\jmath}} - 3x^2y^2\sin x\hat{\boldsymbol{k}}$
	1c	proof
	2	$7/2$
	3a	$5/3$
	3b	proof
	4	proof
MA2VC 2014-15	1a	proof
	1b	$2xy^2\mathrm{e}^x$
	1c	proof
	2	$\sqrt{2}$
	3	$5\log^2 2$
	4	4π
	5	proof
	6	proof
MA3VC 2014-15	1a	proof
	1b	$2\mathrm{e}^{xy+z}(x^2 - y^2)(z - xy)$
	1c	proof, $\vec{\mathbf{A}} = -\frac{1}{2}\psi\vec{\nabla}(\varphi^2)$
	2	$2\sqrt{2}$
	3	$5\log^2 2$
	4	$a^2\pi$
	5	proof
	6	proof

Exam	Question	Final result
MA2VC 2015-16	1a	$\vec{\mathbf{a}}(t) = \cos t\,\hat{\imath} + \sin t\,\hat{\jmath},\ -\pi/2 < t < \pi/2$
	1b	2/3
	1c	$\pi/2$
	2a	proof
	2b	9/20
	2c	proof
	3	proof
	4	1/2
	5	$\pi/6$
	6	proof
MA3VC 2015-16	1a	$\vec{\mathbf{a}}(t) = \cos t\,\hat{\imath} + \sin t\,\hat{\jmath},\ -\pi/2 < t < \pi/2$
	1b	0
	1c	4/3
	2a	proof
	2b	11/40
	2c	proof
	3	proof
	4	1/2
	5	$\pi a^3/6$
	6	proof