

2013 Mathematics (1)

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Section A

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Section B

11W

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12Z

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Solution(s):

From user: ar857

[illegible]

13Z

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14T

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Solution(s):

From user: ar857

2013 Paper I 14T

14T a) $|a \times b|^2 = |a||b|\sin\alpha = |a|^2|b|^2\sin^2\alpha = |a|^2|b|^2 - |a|^2|b|^2\cos^2\alpha = |a|^2|b|^2 - (a \cdot b)^2$

b) $S_A = \frac{1}{2} |P_1 - P_0| |P_2 - P_0| \sin\alpha = \frac{1}{2} |P_1 - P_2| \cdot D$
 $\Rightarrow D = \frac{|P_1 - P_0| |P_2 - P_0| \sin\alpha}{|P_1 - P_2|} = \frac{|(P_1 - P_0) \times (P_2 - P_0)|}{|P_1 - P_2|}$

c) $A[4, 2, 1]$ $CA(2, 1, -2)$ $(-2, 8, 2)$
 $B[0, 1, 1]$ $CB(-2, 0, -2)$ $CA \times CB = (-2, 8, 2)$
 $C[2, 1, 3]$ $x - 4y - z + 3 = 0$

d) $z[0, 0, 5]$
 $y[0, \frac{5}{4}, 0]$ $z_x = (-5, 0, -5)$ $z_x \times z_1 = \frac{25}{4}, -25, -\frac{25}{4}$
 $x[-5, 0, 0]$ $z_y = (0, \frac{5}{4}, -5)$
 $A = \frac{1}{2} |z_x \times z_y| = \frac{1}{2} \cdot \sqrt{\frac{1}{8} + 1} = \frac{75}{4\sqrt{2}} = \frac{75\sqrt{2}}{8}$

15R

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16Y

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Solution(s):

From user: ar857

2013 I B 16

b) ii) $4 \frac{\partial^2 y}{\partial t^2} = 25 \frac{\partial^2 y}{\partial x^2}$

$y = f(t) \cdot g(x)$

$\frac{\partial^2 y}{\partial t^2} = \frac{\partial^2}{\partial t^2} g(x) \rightarrow 4 \frac{\partial^2}{\partial t^2} g(x) = 25 \frac{\partial^2}{\partial x^2} f(x) = k^2$

$4 \frac{\partial^2 f}{\partial t^2} \frac{1}{f(x)} = k^2 \quad 25 \frac{\partial^2 g}{\partial x^2} \frac{1}{g(x)} = k^2$

~~$y(x,0) = \sin 2x = f(x)g(0) \Rightarrow f(x) = \sin 2x$~~

$y(x,0) = \sin 2x = f(x)g(0) \Rightarrow f(x) = \sin 2x$

$y(0,t) = f(0)g(t) = 0 \quad \sin 2x \cos 5t \quad \checkmark$

$y = e^{\frac{k}{5}x} \cdot e^{\frac{k}{2}t} = y = \left(\cos \frac{k}{5}x + \sin \frac{k}{5}x \right) \left(\cos \frac{k}{2}t + \sin \frac{k}{2}t \right)$

$\frac{k}{5} = 2 \Rightarrow k = 10$

$y = \sin 2x \cos 5t \leftarrow \text{initial conditions.}$

17S

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18S

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19X*

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20Y*

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