

# 2006 Mathematics (1)

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## 1A

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## 2A

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## 3B

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## 4B\*

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### ***Solution(s):***

From user: cgl20

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skjlskjsdklflsdskjflskfjlsdk

## 5C

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### ***Solution(s):***

From user: ar857

2006 5C Paper I

a)  $[a, 0, 0] \quad (-a, b, 0) \quad n = (bc, ac, ab)$   
 $[0, b, 0] \quad (-a, 0, c) \quad n = \frac{(bc, ac, ab)}{T}$   
 $[0, 0, c] \quad T = \sqrt{b^2c^2 + a^2c^2 + a^2b^2}$

b)  $bcx + acy + abz = d$   
 $abc = d$

$r \cdot (bc, ac, ab) = abc$

c)  $|OD| = \frac{abc}{T}$

d)  $r = \lambda a + \mu b + \nu c$

$(\lambda a + \mu b + \nu c) \cdot (bc, ac, ab) = (\mu + \lambda + \nu)(abc) = abc$

condition is  $\Rightarrow \mu + \lambda + \nu = 1 \checkmark$

e)  $D = \frac{abc}{T} (bc, ac, ab)$

$= a \frac{b^2c^2}{T} + b \frac{a^2c^2}{T} + c \frac{a^2b^2}{T}$

$\lambda = \frac{b^2c^2}{T} \quad \mu = \frac{a^2c^2}{T} \quad \nu = \frac{a^2b^2}{T}$

f)  $DA = (a - \frac{ab^2c^2}{T}, -\frac{a^2c^2b}{T}, -\frac{a^2b^2c}{T})$

$DB = (0, b, -c)$

$cos \alpha = 0 - \frac{a^2c^2b^2}{T} + \frac{a^2b^2c^2}{T} = 0$

$\alpha = 90^\circ$

6C

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7D

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**Solution(s):**

From user: ar857

8006 I 7

a)  $c = 0.001$   
 $h|c = 0.01$   
 $p|c = 0.05$

i)  $p(p) = p(p|c) + p(p|c)$   
 $= p(p|c)c + p(p|c)c = 0.05 \times 0.999 + 0.19 \times 0.001 = 0.05094$

ii)  $c|p = \frac{p(c) \cap p(p)}{p(p)} = \frac{0.99 \times 0.001}{0.05094} = 0.0194$

iii)  $c|h = \frac{p(c) \cap p(h)}{p(h)} = \frac{0.01 \times 0.001}{0.009 \times 0.01 + 0.999 \times 0.98} = 1.05 \times 10^{-5} \checkmark$

$h|c = \frac{p(c|h)p(h)}{p(c)}$

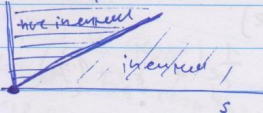
b) i)  $\frac{1}{2} \cdot \frac{2}{6} = \frac{1}{6}$   
 $\frac{1}{3} \cdot \frac{2}{6} + \frac{1}{6} \cdot \frac{2}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$   
 $\frac{1}{2} \cdot \frac{2}{6} + \frac{1}{2} \cdot \frac{2}{6} = \frac{2}{6} + \frac{2}{6} = \frac{4}{6} = \frac{2}{3}$   
 $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{4}{2} = 2$

ii)  $\frac{2}{6} + \frac{1}{2} \cdot \frac{1}{6} = \frac{5}{12} \checkmark$

iii)  $\frac{2}{6} + \frac{1}{2} \cdot \frac{1}{6} + \frac{1}{2} \cdot \frac{1}{6} = \frac{2}{6} + \frac{1}{6} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$   
 $\frac{5}{12} + \frac{1}{2} \cdot \frac{5}{12} = \frac{5}{12} + \frac{5}{24} = \frac{10}{24} + \frac{5}{24} = \frac{15}{24} = \frac{5}{8}$   
 $\frac{5}{12} \cdot \frac{5}{12} = \frac{25}{144}$   
 $1 - \frac{5}{12} = \frac{7}{12}$   
 $\frac{5}{12} \cdot \frac{4}{2} = \frac{5}{9} \checkmark$

8011 I

a)  $\lambda e^{-\lambda x}$   
 $\lambda = \frac{1}{\bar{x}} = \frac{1}{5}$

$t$    $t < s$  increase  
 $y < x$

8D\*

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9E

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10E

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**Solution(s):**

From user: ar857

2006 I. 10

a)  $y'' + 4y = \cos x$

$y_c = D_1 \cos 2x + D_2 \sin 2x$

$y_p = A \cos x + B \sin x$

$y' = -A \cos x - B \sin x + 4A \cos x + 4B \sin x = \cos x$   
 $A = \frac{1}{3} \quad B = 0$

$y = D_1 \cos 2x + D_2 \sin 2x + \frac{1}{3} \cos x \quad D_1 = -\frac{1}{3} \quad D_2 = 0$

$y = \frac{1}{3} (\cos x - \cos 2x)$

b)  $y_p = A \cos^2 x + B \sin^2 x + C \cos x + D \sin x$

$y_p = -2A \cos x \sin x + 2B \sin x \cos x + 2B \cos^2 x - 2B \sin^2 x + C \cos x + D \sin x$   
 $\frac{2A-2B}{2B-2A} = 1$   
 $C=0 \quad D=0$

✓  $y'' + 4y = \cos^2 x = \frac{1}{2} \cos 2x + \frac{1}{2}$  CORRECT  
 $y_p = A \cos 2x + B \sin 2x + C$   
 $y_p' = -2A \sin 2x + 2B \cos 2x$   
 $y_p'' = -2A \cos 2x - 2B \sin 2x + 4C$   
 $-2A \cos 2x - 2B \sin 2x + 4C = \frac{1}{2} \cos 2x + \frac{1}{2}$   
 $-2A = \frac{1}{2} \Rightarrow A = -\frac{1}{4}$   
 $-2B = 0 \Rightarrow B = 0$   
 $4C = \frac{1}{2} \Rightarrow C = \frac{1}{8}$   
 $y = C_1 \sin 2x + C_2 \cos 2x - \frac{1}{4} \cos 2x + \frac{1}{8}$   
 $y(0) = C_2 + \frac{1}{8} = 0 \Rightarrow C_2 = -\frac{1}{8}$   
 $y'(0) = 2C_1 = 0 \Rightarrow C_1 = 0$   
 $y = -\frac{1}{8} \cos 2x + \frac{1}{8} \sin 2x + \frac{1}{8}$  ✓

c)  $y_p = Ax^2 + Bx$

$\Rightarrow y = C_1 e^x + C_2 x e^x + \frac{1}{2} x^2 e^x + \frac{1}{8} x^3 e^x$

11F

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12F\*

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