2007 Mathematics (1)

Section A

1

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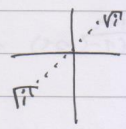
Solution(s):

From user: ar857

2007 I 2T

a) i) $\sqrt{i}$



$z_1 = \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}i$

$z_2 = -\frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}i$

ii) $\ln(-e) = \ln(e) + \ln(-1) = 1 + \ln(\cos\pi + i\sin\pi) = 1 + \ln e^{\pi i} = 1 + \pi i$

iii) $2^i = z$

$\ln z = i \ln 2 \quad e^{\ln z} = z = e^{i \ln 2} = \cos(\ln 2) + i\sin(\ln 2)$

iv) $(i^i)^i = i^{i^2} = i^{-1} = \frac{1}{i} = \frac{1}{i} \cdot \frac{-i}{-i} = -i$

b) $\sin 3x = \mathrm{Im}\left[e^{ix}\right]^3 = \mathrm{Im}\left[(\cos x + i\sin x)^3\right]$

$= 3\cos^2 x \sin x - \sin^3 x = 3\sin x - 4\sin^3 x$

c) $3\sin x - 4\sin^3 x = 2\sin x$

$\sin x = \sin x \cdot 4\sin^2 x$

Solution #1: $\sin x = 0 \quad \therefore \quad x = 0 + k\pi$

Solution #2: $\sin x = \pm \frac{1}{2} \quad \therefore \quad x = \pi/6 + \frac{2}{3}k\pi$

or $x = \frac{7\pi}{6} + \frac{2}{3}k\pi$

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Solution(s):

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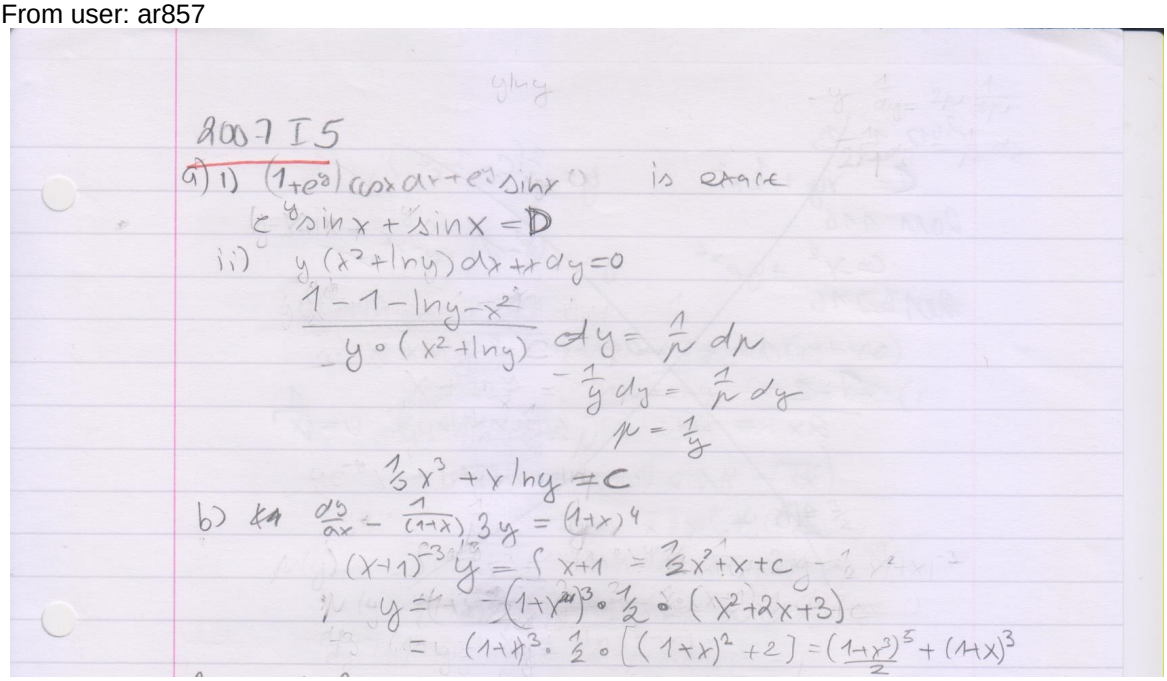

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Solution(s):

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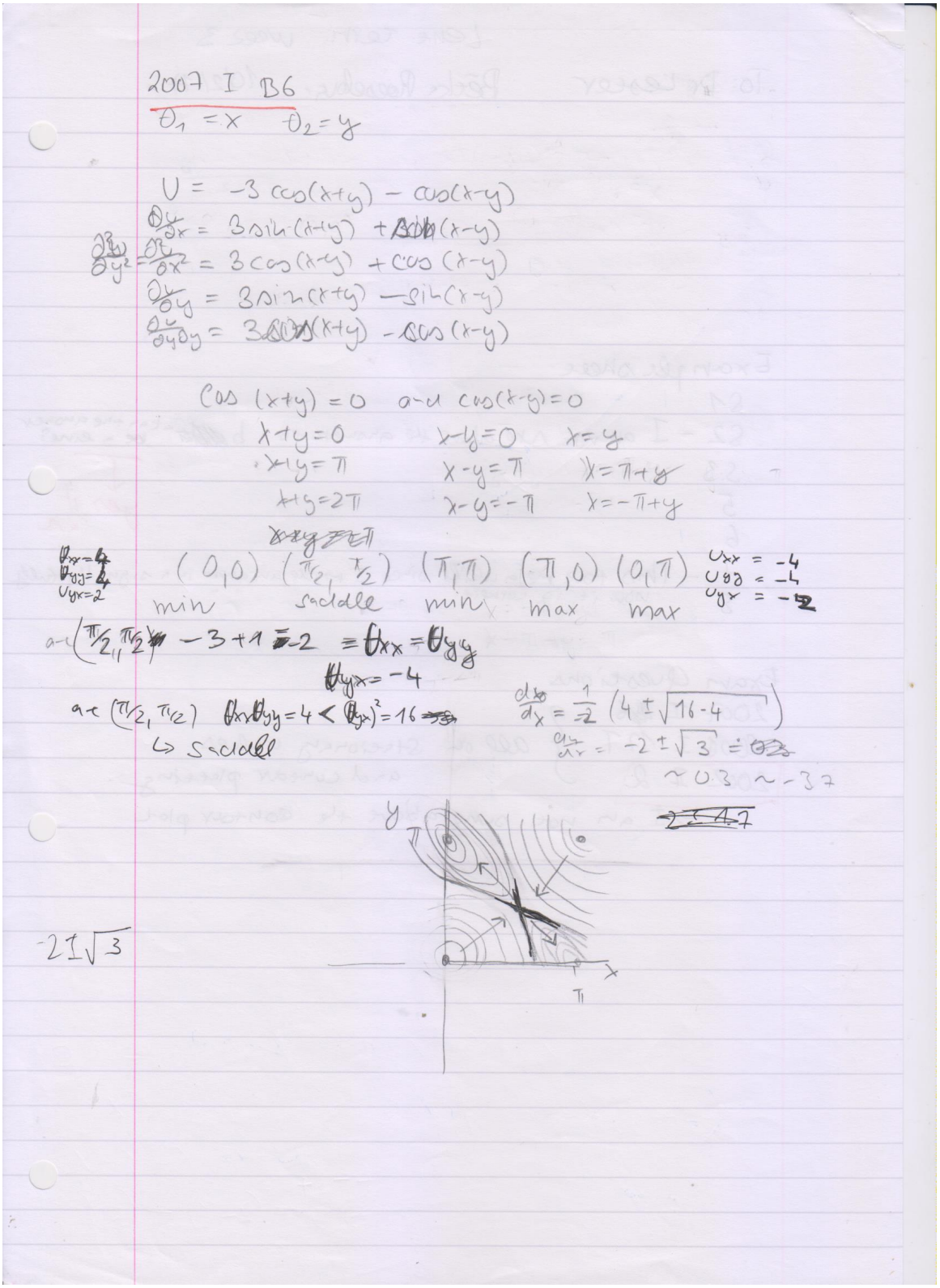

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Section B

1Y

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Solution(s):

From user: cgl20
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Rosalind's supervision test

2T

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3Z

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4X

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5Z

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6T

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7R

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8S

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9X*

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10Y*

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