

Test 1

DATE: February 7, 2008
COURSE: MATH 2130

Page: 1 of 5
TIME: 70 minutes
EXAMINER: G.I. Moghaddam

NAME: _____

STUDENT # : _____

There are 6 questions of total mark 50.

- [10] 1. Find the distance between the point $P(1, -1, 2)$ and the line
 $x = 2 + t, \quad y = 3t, \quad z = 1 - t.$
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Test 1

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Page: 2 of 5
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- [6] 2. Identify and draw the surface with the equation

$$x^2 + z^2 - 2x - 2z + y + 4 = 0.$$

- [6] 3. Find a parametric representation for the curve $x^2 + y + z = 2$ and $xy + z = 1$.
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Test 1

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Page: 3 of 5
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- [10] 4. Given the plane $\Pi : 2x + 2y + z = -22$ and the line
 $\ell : x = 1 + 2t, y = -3 + t, z = 4 + 5t.$
- [5] (a) Find a possible intersection point of the line ℓ with the plane Π .(if any)
- [5] (b) Find a simplified equation of the plane through the point $P(1, 1, 1)$ which is parallel to the line ℓ and perpendicular to the plane Π .
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Test 1

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Page: 4 of 5
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[10] 5. Given the curve C with vector representation

$$C : \mathbf{r}(t) = e^{-t} \sin t \hat{\mathbf{i}} + 2\hat{\mathbf{j}} + e^{-t} \cos t \hat{\mathbf{k}}$$

[5] (a) Find a unit tangent vector to the curve C at the point $(0, 2, 1)$.

[5] (b) Find the arc length of the curve C between the two points $(0, 2, 1)$ and $(0, 2, e^{-2\pi})$.

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Page: 5 of 5
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- [8] 6. Given the vector functions $\mathbf{u} = -2t\hat{\mathbf{i}} + t^2\hat{\mathbf{j}} - t\hat{\mathbf{k}}$ and $\mathbf{v} = t\hat{\mathbf{i}} + \frac{1}{t}\hat{\mathbf{j}} + \hat{\mathbf{k}}$ and the real-valued function $f(t) = -3t$, evaluate

$$\int (f\mathbf{u} \times \mathbf{v}).$$
