

## **Past class tests**

Information booklet for MATH1231/1241 lists the material available for examination in the current schedule of class tests. These tests are samples only and simply are a guide to style and level of difficulty. They are not a replacement for doing the tutorial problems.

UNIVERSITY OF NEW SOUTH WALES  
SCHOOL OF MATHEMATICS AND STATISTICS  
MATH1231/MATH1241 CALCULUS S2 2009  
TEST 1 VERSION 7a

This sheet must be filled in and stapled to the front of your answers

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Student's Family Name

Initials

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Student Number

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Tutorial Code

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Tutor's Name

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Mark

**Note: The use of a calculator is NOT permitted in this test**

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (*2 marks*)

Let  $z = xy$ , where  $x = 2 \cos 3t$  and  $y = 4 \sin 3t$ . Use a chain rule to find  $\frac{dz}{dt}$ .

2. (*3 marks*)

Find a normal vector  $\mathbf{n}$  and the equation of the tangent plane to the surface

$$z = 3x^2 - y^2 - 2$$

at the point  $(-1, 2, -3)$

3. (*2 marks*)

Find  $\int \sec^4 \theta \, d\theta$ .

4. (*3 marks*)

Use a trigonometric substitution to find  $\int_0^2 \sqrt{4 - x^2} \, dx$ .

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UNIVERSITY OF NEW SOUTH WALES  
SCHOOL OF MATHEMATICS AND STATISTICS  
MATH1231/MATH1241 CALCULUS S2 2011  
TEST 1 VERSION 1a

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Student's Family Name

Initials

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Student Number

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Tutorial Code

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Tutor's Name

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Mark

**Note:** The use of a calculator is NOT permitted in this test

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (1 mark)

Let  $z = e^{xy^2}$ . Find  $\frac{\partial z}{\partial y}$ .

2. (2 marks)

Let  $z = \cos(x + 2y)$ . Show that  $z$  satisfies the differential equation  $4\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = 0$ .

3. (2 marks)

Let  $z = x^2 + 3y^2$ , and  $x = 2t^2, y = t^3$ . Use a chain rule to find  $\frac{dz}{dt}$  as a function of  $t$ .

4. (3 marks)

Find a normal vector  $\mathbf{n}$  and the equation of the tangent plane to the surface

$$z = \sqrt{x^2 + 2y^2}$$

at the point  $(-1, 2, 3)$

5. (2 marks)

Use a trigonometric substitution to find  $\int_0^2 \frac{1}{(4 + x^2)^{3/2}} dx$ .

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UNIVERSITY OF NEW SOUTH WALES  
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MATH1231/MATH1241 CALCULUS S2 2011  
TEST 1 VERSION 1b

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Student's Family Name

Initials

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Tutor's Name

Mark

**Note:** The use of a calculator is NOT permitted in this test

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (*2 marks*)

Let  $z = 2x^2 + y^2$ , and  $x = t^2, y = 4t^3$ . Use a chain rule to find  $\frac{dz}{dt}$  as a function of  $t$ .

2. (*3 marks*)

Find a normal vector  $\mathbf{n}$  and the equation of the tangent plane to the surface

$$z = x^2y - 2y^2 + 3x$$

at the point  $(1, 1, 2)$

3. (*2 marks*)

Use a trigonometric substitution to find  $\int_0^3 \frac{1}{(9 + x^2)^{3/2}} dx$ .

4. (*1 mark*)

Let  $z = \ln(x^2 + y^2)$ . Find  $\frac{\partial z}{\partial x}$ .

5. (*2 marks*)

Let  $z = \sin(x + 2y)$ . Show that  $z$  satisfies the differential equation  $4\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = 0$ .

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UNIVERSITY OF NEW SOUTH WALES  
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MATH1231/MATH1241 CALCULUS S2 2011  
TEST 1 VERSION 2a

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Student's Family Name

Initials

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Student Number

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Tutorial Code

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Tutor's Name

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Mark

**Note:** The use of a calculator is NOT permitted in this test

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (2 marks)

Let  $z = e^{x^2y^3}$ . Find  $\frac{\partial z}{\partial x}$  and  $\frac{\partial^2 z}{\partial y \partial x}$ .

2. (4 marks)

Let  $z = \frac{\sqrt{x} + 1}{y + 1}$ . The measured values of  $x$  and  $y$  are 9 cm and 1 cm respectively and each of the measurements is made with an error whose absolute value is at most 0.03 cm. Use the total differential of  $z$  to estimate the maximum error in the calculated value of  $z$ .

3. (2 marks)

Find  $\int_0^{\pi/2} \sin^3 \theta \cos^2 \theta d\theta$ .

4. (2 marks)

Given that

$$\int_0^1 (1 - x^2)^n dx = \frac{2n}{2n + 1} \int_0^1 (1 - x^2)^{n-1} dx$$

for  $n \geq 1$ , find  $\int_0^1 (1 - x^2)^4 dx$ . [Note that you are NOT being asked to prove the recurrence relation.]

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UNIVERSITY OF NEW SOUTH WALES  
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MATH1231/MATH1241 CALCULUS S2 2008  
TEST 2 VERSION 3b

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Student's Family Name

Initials

Student Number

Tutorial Code

Tutor's Name

Mark

**Note: The use of a calculator is NOT permitted in this test**

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (*2 marks*)

Solve the differential equation

$$y\sqrt{2x^2 + 3} dy + x\sqrt{4 - y^2} dx = 0$$

given that  $y = 1$  when  $x = 0$ .

2. (*2 marks*)

Find the general solution of

$$\frac{d^2y}{dt^2} + 8\frac{dy}{dt} + 16y = 0.$$

3. (*3 marks*)

Find  $\int \frac{x}{x^2 + 2x + 10} dx$ . [You are given that  $\int \frac{du}{u^2 + a^2} = \frac{1}{a} \tan^{-1} \frac{u}{a} + C$  for  $a \neq 0$ ]

4. (*3 marks*)

Solve

$$2\frac{dy}{dx} - y = e^x$$

given that  $y = 0$  at  $x = 0$ .

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UNIVERSITY OF NEW SOUTH WALES  
SCHOOL OF MATHEMATICS AND STATISTICS  
MATH1231/MATH1241 CALCULUS S2 2009  
TEST 2 VERSION 3a

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Student's Family Name

Initials

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Student Number

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Tutorial Code

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Tutor's Name

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Mark

**Note:** The use of a calculator is NOT permitted in this test

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (3 marks)

Find  $\int \frac{x+4}{(2x+1)(x-3)} dx$ .

2. (3 marks)

Show that the differential equation

$$(2x + 3y)dx + (3x + 4y)dy = 0$$

is exact, and find the general solution.

3. (4 marks)

(i) Find the general solution of the equation

$$\frac{d^2y}{dt^2} - 7\frac{dy}{dt} + 12y = 0$$

(ii) Find the solution to the equation in part (i) that satisfies  $y = 3$  and  $\frac{dy}{dt} = 10$  at  $t = 0$ .

(iii) If the 0 on the right hand side of the equation in part (i) were changed to  $e^{3t}$ , what *form* of particular solution would you seek? (Do *not* evaluate the unknown coefficients.)

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UNIVERSITY OF NEW SOUTH WALES  
SCHOOL OF MATHEMATICS AND STATISTICS  
MATH1231/MATH1241 CALCULUS S2 2013  
TEST 2 VERSION 1a

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Initials

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Tutorial Code

Tutor's Name

Mark

**Note: The use of a calculator is NOT permitted in this test**

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (3 marks)

Find  $\int \frac{x-3}{(2x-1)(x+2)} dx$ .

2. (3 marks)

Show that the differential equation

$$(y - y \sin xy) dx + (x - x \sin xy) dy = 0$$

is exact and find the general solution.

3. (4 marks)

(i) Find the general solution of the equation

$$\frac{d^2y}{dt^2} - \frac{dy}{dt} - 12y = 0.$$

(ii) Find the solution to the equation in part (i) that satisfies  $y = 3$  and  $\frac{dy}{dt} = 2$  at  $t = 0$ .

(iii) If the 0 on the right hand side of the equation in part (i) were changed to  $e^{-3t}$ , what *form* of particular solution would you seek? (Do *not* evaluate the unknown coefficients.)

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UNIVERSITY OF NEW SOUTH WALES  
SCHOOL OF MATHEMATICS AND STATISTICS  
MATH1231/MATH1241 CALCULUS S2 2013  
TEST 2 VERSION 1b

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Tutorial Code

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Tutor's Name

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Mark

**Note:** The use of a calculator is NOT permitted in this test

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (*3 marks*)

Show that the differential equation

$$(x + 1)ye^x dx + (xe^x + y^2e^y)dy = 0$$

is exact and find the general solution.

2. (*4 marks*)

(i) Find the general solution of the equation

$$\frac{d^2y}{dt^2} + \frac{dy}{dt} - 6y = 0.$$

(ii) Find the solution to the equation in part (i) that satisfies  $y = 1$  and  $\frac{dy}{dt} = -4$  at  $t = 0$ .

(iii) If the 0 on the right hand side of the equation in part (i) were changed to  $e^{-3t}$ , what *form* of particular solution would you seek? (Do *not* evaluate the unknown coefficients.)

3. (*3 marks*)

Find  $\int \frac{2x + 6}{(3x + 1)(x - 1)} dx$ .

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UNIVERSITY OF NEW SOUTH WALES  
SCHOOL OF MATHEMATICS AND STATISTICS  
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TEST 2 VERSION 2a

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Student's Family Name

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Student Number

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Tutorial Code

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Tutor's Name

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Mark

**Note: The use of a calculator is NOT permitted in this test**

**QUESTIONS** (*Time allowed: 20 minutes*)

1. (3 marks)

Find  $\int \frac{1}{x^2 + 4x + 8} dx$ . [You are given that  $\int \frac{du}{u^2 + a^2} = \frac{1}{a} \tan^{-1} \frac{u}{a} + C$  for  $a \neq 0$ ]

2. (3 marks)

Show that the differential equation

$$2e^{2y} dx + (4x - y - 1)e^{2y} dy = 0$$

is exact and find the general solution.

3. (4 marks)

(i) Find the general solution of the equation

$$\frac{d^2 y}{dt^2} + 4y = 0.$$

(ii) Find the solution to the equation in part (i) that satisfies  $y = 2$  and  $\frac{dy}{dt} = 6$  at  $t = 0$ .

(iii) If the 0 on the right hand side of the equation in part (i) were changed to  $\cos 2t$ , what *form* of particular solution would you seek? (Do *not* evaluate the unknown coefficients.)

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