

Answer sheet (To be handed in)

Week 7 Coursework Test (2018)

MATH10222/11222

Calculus and Applications

You Should Try to Answer All Questions

- Mark with an 'X' only one box corresponding to the correct answer to each of the questions on the question sheet.
- **Important:** negative marking will be used for incorrect answers. You are free not to give an answer if you wish.
- The table below indicates the marks awarded for a [r]ight, [w]rong and [n]o answer for each question.
- The highest possible total mark is 23 — the lowest mark is zero.
- A total mark of 23 counts as 100% for the test.
- This document has 8 pages.

Full name:

Student identity number:

Name of supervisor:

							[r][w][n]				
1.	(a)	<input checked="" type="checkbox"/>	(b)	<input type="checkbox"/>			[1][-1][0]				
2.	(a)	<input type="checkbox"/>	(b)	<input checked="" type="checkbox"/>	(c)	<input type="checkbox"/>	[2][-1][0]				
3.	(a)	<input type="checkbox"/>	(b)	<input type="checkbox"/>	(c)	<input checked="" type="checkbox"/>	(d)	<input type="checkbox"/>	[3][-1][0]		
4.	(a)	<input type="checkbox"/>	(b)	<input checked="" type="checkbox"/>				[1][-1][0]			
5.	(a)	<input type="checkbox"/>	(b)	<input checked="" type="checkbox"/>				[1][-1][0]			
6.	(a)	<input type="checkbox"/>	(b)	<input type="checkbox"/>	(c)	<input type="checkbox"/>	(d)	<input checked="" type="checkbox"/>	(e)	<input type="checkbox"/>	[8][-2][0]
7.	(a)	<input type="checkbox"/>	(b)	<input type="checkbox"/>	(c)	<input checked="" type="checkbox"/>	(d)	<input type="checkbox"/>	(e)	<input type="checkbox"/>	[4][-1][0]
8.	(a)	<input type="checkbox"/>	(b)	<input type="checkbox"/>	(c)	<input type="checkbox"/>	(d)	<input checked="" type="checkbox"/>			[3][-1][0]

At the end of the test please separate this answer sheet from the question sheets and hand it in.

Question sheet (Not to be handed in)

Week 7 Coursework Test (2018)

MATH10222/11222 Calculus and Applications

You Should Try to Answer All Questions

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1. The initial value problem comprising the ODE

[1]

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

with initial condition $y(x = X) = Y$ where X and Y are given constants, is guaranteed to have a unique solution for all values of x .

- (a) \Rightarrow false
 (b) true

2. The initial value problem comprising the ODE

[2]

$$y'' + \frac{1}{x} y' - \frac{4}{x^2} y = 0$$

with initial conditions $y(x = 1) = 1$ and $y'(x = 1) = 2$

- (a) is guaranteed to have a unique solution for $x \in \mathbb{R}$ because the ODE is linear.
 (b) \Rightarrow is guaranteed to have a unique solution for $x > 0$.
 (c) can only have a solution for $x > 0$ because the coefficients $1/x$ and $4/x^2$ are singular at $x = 0$.

3. The integrating factor for the first-order ODE

[3]

$$\frac{dy}{dx} - 3x^2 = -\frac{y}{x}$$

is

- (a) $\int \exp(-3x^2) dx$
 (b) $\exp(-\int 3x^2 dx)$
 (c) $\Rightarrow \exp(\int \frac{1}{x} dx)$
 (d) $\int \exp(\frac{1}{x}) dx$

4. The functions $y_1(x) = \exp(x)$ and $y_2(x) = \exp(a + x)$ where a is a constant are linearly independent provided $a \neq 0$.

[1]

(a) true

(b) \Rightarrow false

5. The *general* solution to the homogeneous ODE

[1]

$$xy'' + y y' = 0$$

is given by $y(x) = Ay_1(x) + By_2(x)$ where A and B are arbitrary constants and $y_1(x)$ and $y_2(x)$ are *any* two nonzero, linearly independent solutions of the ODE.

(a) true

(b) \Rightarrow false

6. The general solution of the ODE

[8]

$$y'' - 3y' + 2y = 1 + \exp(2x)$$

is given by

(a) $y(x) = \exp(2x)(A \cos(x) + B \sin(x)) + \frac{1}{2} + x \exp(2x)$

(b) $y(x) = A \exp(-2x) + B \exp(-x) + 1 + x \exp(2x)$

(c) $y(x) = A \exp(2x) + B \exp(x) + 1 + \exp(2x)$

(d) $\Rightarrow y(x) = A \exp(2x) + B \exp(x) + \frac{1}{2} + x \exp(2x)$

(e) $y(x) = A \exp(-2x) + B \exp(-x) + \frac{1}{2} + x \exp(2x)$

where A and B are arbitrary constants.

7. The general solution of the ODE

$$x \frac{dy}{dx} = x + y$$

[4]

is given by

- (a) $y(x) = x \ln |x| + C$
- (b) $y(x) = x \ln |x| + x + C$
- (c) $\Rightarrow y(x) = x \ln |x| + Cx$
- (d) $y(x) = C \ln |x| + x$
- (e) $y(x) = Cx \ln |x| + x$

where C is an arbitrary constant.

8. The solution of the initial value problem

[3]

$$\frac{dy}{dx} = \frac{1}{2y} \exp(x - y^2), \quad y(0) = 1$$

is given by

- (a) $y(x) = (\ln(\exp(x) + 1))^{1/2}$
- (b) $y(x) = -(\ln(\exp(x) + \exp(1) - 1))^{1/2} + 2$
- (c) $y(x) = (x + 1)^{1/2}$
- (d) $\Rightarrow y(x) = (\ln(\exp(x) + \exp(1) - 1))^{1/2}$

End of test

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