

Final Exam
Academic Year 1443-1444 Hijri- First Semester

Exam Information معلومات الامتحان		
Course name	Differential Equations	
Course Code	Math 318 رياض 318	
Exam Date	2022-11-16	Click or tap to enter a date.
Exam Time	08: 00 AM	
Exam Duration	3 hours	ثلاث ساعات
Classroom No.		
Instructor Name	Dr. Mustafa Damlakhi	
		اسم المقرر
		رمز المقرر
		تاريخ الامتحان
		وقت الامتحان
		مدة الامتحان
		رقم قاعة الاختبار
		اسم استاذ المقرر

Student Information معلومات الطالب		
Student's Name		
ID number		
Section No.		
Serial Number		
		اسم الطالب
		الرقم الجامعي
		رقم الشعبة
		الرقم التسلسلي

General Instructions:

- Your Exam consists of PAGES (except this paper)
- Keep your mobile and smart watch out of the classroom.
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- عدد صفحات الامتحان صفحة. (باستثناء هذه الورقة)
- يجب إبقاء الهواتف والساعات الذكية خارج قاعة الامتحان.
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هذا الجزء خاص بأستاذ المادة
This section is ONLY for instructor

#	Course Learning Outcomes (CLOs)	Related Question (s)	Points	Final Score
1				
2				
3				
4				
5				
6				
7				
8				

- I) i) Find a general solution of the differential equation $(x+1)\frac{dy}{dx} + (x+2)y = 2xe^{-x}$, $x > -1$. (4 points)
- ii) Show that $\mu(y) = y^3$ is an integrating factor of the differential equation $xydx + (2x^2 + 3y^2 - 20)dy = 0$ and solve the equation. (4 points)
- II) i) Find a general solution of the differential equation $y'' - 16y = 2e^{4x}$. (4 points)
- ii) Find the form of a particular solution of the differential equation $y^{(4)} - y'' = x + 2xe^x - 3xe^{-x}$ (Do not evaluate the coefficients). (4 points)
- iii) Bacteria in culture grow at a rate proportional to the number of bacteria present at any time. Initial number of bacteria is 2000 and it is increased by 50% in 10 hours. What will be the number of bacteria in 20 hours? (4 points)
- III) i) Find a general solution of the differential equation $xy'' + (1 - 2x)y' + (x - 1)y = 0$, $x > 0$, knowing that $y_1 = e^x$ is a particular solution of the given equation. (4 points)
- ii) Find the solution of the initial value problem $x^2y'' + 3xy' + 2y = 0$, $y(1) = 0$, $y'(1) = 1$. (4 points)
- IV) Find a general solution to the differential equation $y'' - 2y' + y = \frac{e^x}{x}$, $x > 0$. (6 points)
- V) Let $f(x) = \begin{cases} 0 & , \quad -\pi < x < -\frac{\pi}{2} \\ -1 & , \quad -\frac{\pi}{2} \leq x < 0 \\ 0 & , \quad x = 0 \\ 1 & , \quad 0 < x \leq \frac{\pi}{2} \\ 0 & , \quad \frac{\pi}{2} < x < \pi \end{cases}$
- i) Sketch the function f on $(-\pi, \pi)$. (2 points)
- ii) Compute the Fourier series of f on $(-\pi, \pi)$. (4 points)