MA2160
FINAL EXAM – Spring 2006
Non-Calculator Section

Name _____ **ID** _____
(please print)

Circle your section number and instructor's name:

Course	Section	Instructor	Days and Time
MA2160	R01	R. Kolkka	MWF 08:05
	R02	D. Yorgov	MWF 12:05
	R03	R. Kolkka	MWF 09:05
	R04	T. Grassl	MWF 08:05
	R05	S. Srinivasan	MWF 10:05
	R06	S. Tao	MWF 11:05
	R07	E. Westlund	MWF 11:05
	R08	M. Keranen	MWF 12:05
	R09	D. Lewandowski	MWF 02:05
	R10	A. Niu	MWF 02:05
	R11	L. Erlebach	MWF 03:05
	R12	L. Erlebach	MWF 04:05

Page	Score
1	/ 10
2	/ 10
3	/ 10
4	/ 10
5	/ 12
6	/ 10
7	/ 10
8	/ 12
SUBTOTAL	/ 84

Show all work. Calculators are NOT allowed on this section. Work this Non-Calculator part first. It must be turned in before you use your calculator on Part II

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Non-Calculator Section

1. Evaluate $\int_0^1 \frac{1}{x^2+1}\,dx$.

_____ (5 pts)

2. Evaluate $\int_1^2 2x\left(\ln\left(x\right)\right)dx$.

_____ (5 pts)

3. Evaluate $\int_4^{\infty} \frac{1}{(x-1)^2}\,dx$.

_____ (5 pts)

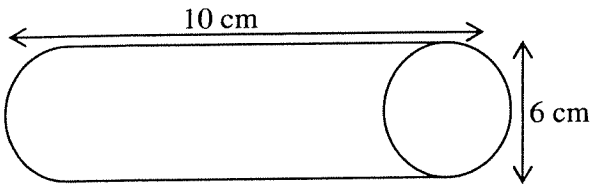
4. Calculate the integral $\int \frac{1}{(x+2)(x+3)}\,dx$.

_____ (5 pts)

5. Find the solution $y(x)$ to the differential equation $x\frac{dy}{dx}=4y$ subject to initial condition $y(1)=3$.

_____ (5 pts)

6. Find the volume of the solid cylinder below using integration.



_____ (5 pts)

7. Find the sum of the series $-1+\frac{1}{2}-\frac{1}{4}+\frac{1}{8}-\frac{1}{16}+\ldots$

_____ (5 pts)

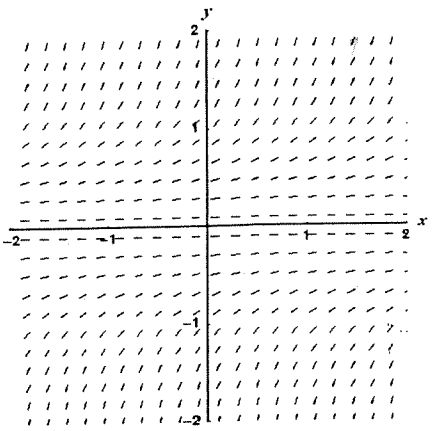
8. Write the 2nd degree Taylor polynomial approximation to the function $x^{\frac{3}{2}}$ for values of x near $x=4$. **Show your work.**

_____ (5 pts)

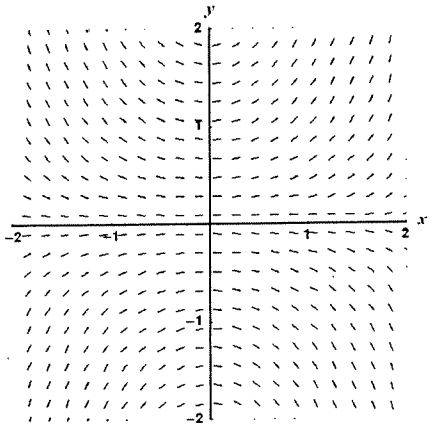
9. Consider the slope fields given below.

a) Sketch the solution curve through the point $(-1,-1)$ for each of the following slope fields.

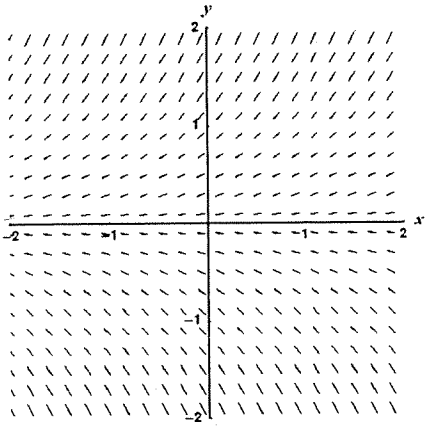
Extend each curve as far to the left and right as possible. (6 pts)



Slope field A



Slope field B



Slope field C

b) Match the slope fields from part (a) with the following differential equations: (6 pts)

Differential equation	Slope field
$y' = y$	
$y' = y^2$	
$y' = xy$	

10. The function $f(x)=e^x$ is approximated by a Taylor polynomial of degree 3 about $x=0$ on the interval $[0,1]$. Use the Lagrange error bound to find an upper bound for the approximation error.

_____ (5 pts)

11. Trying to model the response to a stimulus, psychologists use the Weber-Fechner Law. This law states that the rate of change of a response, *r*, with respect to a stimulus, *s*, is inversely proportional to the stimulus. Model this law as a differential equation. Solve this differential equation with the initial condition that $r(s_0)=r_0$. Simplify your answer.

_____ (5 pts)

12. Use Euler's method with $y(0)=10$ as the initial condition with 2 steps to estimate y when $x=1$ for the differential equation $\frac{dy}{dx}=y+x$.

_____ (5 pts)

13. Two like magnetic poles repel each other with a force $F=\frac{k}{x^2}$ newtons, where k is a constant. Express the work needed to move them along a line from $\frac{1}{3}$ meters apart to 1 meter apart.

_____ joules (5 pts)

14. Consider the vectors $\vec{u} = 3\vec{i} + 2\vec{j} + \vec{k}$ and $\vec{v} = \vec{i} - \vec{j} + \vec{k}$.

a) Find $\vec{u} \times \vec{v}$.

_____ (4 pts)

b) Find a unit vector in the direction of $\vec{u}$.

_____ (4 pts)

c) Compute the cosine of the angle between $\vec{u}$ and $\vec{v}$.

_____ (4 pts)

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Page	Score
1	/ 10
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SUBTOTAL	/ 16
Subtotal of non-calc section	/ 84
TOTAL	/ 100

Show all work. Calculators ARE allowed on this section.

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Calculator Section

1. Write in the form $ax+by+cz=d$ an equation of a plane which is perpendicular to the vector $3\vec{i}+2\vec{j}-\vec{k}$ and contains the point $(0,1,-1)$.

_____ (5 pts)

2. Consider the region bounded by the curves $y=x^2, x=1$, and the x-axis from $x=0$ to $x=1$. Find the volume of the solid obtained by rotating this region abut the line $y=1$.

_____ (5 pts)

3. A can of soda pop is put into a refrigerator that is kept at $35^\circ F$. The cooling of the can is modeled by Newton's law of cooling $\frac{dh}{dt} = -k(h-35)$. Solve the differential equation if the can was at $80^\circ F$ when it was placed in the refrigerator and its temperature after 10 minutes is $50^\circ F$.

_____ (6 pts)