

Math 120/ALES 291 Final Exam

Date & Time Friday April 23, 9am-12pm, in the Lecture Hall

Bring Scientific calculator
Pens and/or pencils, ruler
Your Formula/Cheat sheet
Beverage and snack, if you want
Non-phone music player and headphones, if you want.

Formula/Cheat sheet

Write anything you want on one side of an $8\frac{1}{2} \times 11$ inch sheet of paper. Formulas. Procedures. Exhortations to yourself! Whatever information you worry about forgetting, or think will help you on the exam.

How the exam will be organized

Questions will be ordered by topic in the same order we covered them (not by difficulty).

180 minutes & 180 marks $\Rightarrow$ 1 mark / minute i.e. 10 mark questions $\Rightarrow$ 10 minutes.

40-40-20 Rule I use when making up exams:

40% of questions are like easy questions from homework.

40% are straightforward: just like homework or assignment problems we have done, but not the easiest ones.

20% are similar to, but not exactly like something you've done on homework or assignments.

How to write the exam

You have all been students for a long time, so by now **you know best what works for you**. So what follows are just some points to keep in mind or suggestions to consider:

- Questions do not have to be done, or submitted, in order. I'd do the ones I am most confident about first.
- If you get stuck move on and revisit the question later.
- Assume I have the question in front of me: you don't have to copy out or repeat any of the information in the question for my sake.
- Keep careful track of which problems you have finished and which ones you have not.

Exam Instructions

These are the exam instructions I have in mind at the moment. I am providing them ahead of time to give you an idea of what to expect, but you should **read the exact instructions on your exam before beginning it!**

Instructions:

- ◆ You have three **(3)** hours to complete the examination.
- ◆ You may use a scientific calculator, but **not** a graphing calculator, software or online services.
- ◆ The value of all questions is shown — choose well, and use your time wisely!
- ◆ A box **must** be placed around your final answer to each question.
- ◆ Part marks can only be given if your rough work is shown. **No marks** will be given for unsupported answers.
- ◆ If you are unsure of anything, **ask!**

Examinable Topics, Weights, and Problem Types

Note that the mark weights shown here are approximate, say ± 5 . You'll notice that here they add to 190, but on your exam they will add to 180, so there will be a little cutting here, a little adding there, as I make up the actual exam questions.

Marks	Topic
10	Linear Models • $y = mx + b$ and $Ax + By = C$ • Formulate equation from English description • Use an equation to make prediction, interpolate, etc. • Probably a word problem, e.g. 2014¹#1, 2020#1
0	Systems of Equations Using Matrices • Not directly examined!

¹ 2014 = 2014 Final Exam available at

https://www.timtopper.com/Math120.W21/16.12_Math120_Exam_2014.pdf

2020 = 202 Finale Exam available at

https://www.timtopper.com/Math120.W21/16.13_Math120_Exam_2020.pdf

ES = Exercise Set

20	Linear Programming: Graphical Solution An entire word problem done from start to finish, e.g. 2014#2, 2020#2
15	Linear Programming: Simplex Method You won't be asked to solve an entire problem from start to finish (too much pivoting!). Instead you will be asked about individual steps in the process: - e.g. Choose the next pivot (maximization or minimization, remember the rules differ!) - e.g. Choose the next pivot and pivot the tableau once 2014#3, 2020#3 - e.g. Interpret a tableau, e.g. 2014#4, 2020#4
15	Nonlinear Models and Functions - Quadratic, Exponential/Logistic, Sinusoidal - Sketch given function, e.g. 2014#5 - Write equation given graph, e.g. 2014#6, 2020#5 - Formulate and use, e.g. Given values at two points in time find rate of exponential growth, e.g. 2020#6
30	Derivatives - Given picture of a function sketch its derivative, e.g. 2014#7, 2020#7 - Find the derivative of a given function, e.g. 2014#8 - Optimization word problem $f'(x) = 0$, e.g. 2020#9 - Differential Equations: Is this function a solution to this DE, e.g. 2014#9, 2020#8 - Sketch the trajectory of a system through phase space, e.g. 2014#10, 2020#10
15	Integrals - Find the integral of a function. - Small word problem, e.g. 2014#11, 2020#11
30	Probability 'Simple' probabilities $p(A)$, $p(B)$, $1 - p(A)$, e.g. 2014#12, 2020#12. - Conditional probabilities $p(A B)$ - Probability trees, e.g. fill in missing values, e.g. ES16 #3 - Bayes theorem (always a word problem), e.g. 2014#13, 2020#13 - Combinatorics, e.g. 2014#14, poker hand problems.
30	Graph Theory - Graph properties: # nodes, # edges, loops?, directed or not, draw given matrix, e.g. 2014#15 - Minimal Spanning Tree on graph and in matrix, e.g. 2020#14 - Shortest Route on graph and in matrix, e.g. 2014#16, 2020#15 - Connectivity/Reachability: I won't ask you to multiply matrices, but might ask you to interpret them. Or to find some individual entries in a product, e.g. 2020#16
15	Markov Processes A small word problem, e.g. 2014#17, 2020#17, 2020#18
10	Teacher's choice Something a bit different, but based on the course material, e.g. 2014#18, 2020#19