Midterm Study Guide

Math 34A

All practice problems were written to be doable WITHOUT a calculator.

Reminders about the test

- The midterm will be during class on Thursday, July 8
- Bring a photo ID to the exam
- There are NO calculators
- There are NO books or notes allowed for the exam
- You are allowed a 3×5 notecard with whatever you want written on both sides

How to show your work so the grader can follow easily + other tips:

- Include all non-obvious steps. If you are ever unsure whether to include a step, write it down to be safe.
- For word problems, declare any variables (or appropriately label a diagram) before using them.
- Simplify your answers (combine like terms, finish simple arithmetic, simplify fractions).
- Box your answers.
- Double-check that your answer makes sense (this is particularly important with word problems).
- Don't forget to include units in your final answer, when applicable, and be sure those units make sense.
- If you make an error, erase it or cross it out, so the grader does not mistake it for work you want to be graded.
- If the arithmetic gets too crazy, you are probably doing something wrong.
- If you are in need of more practice problems, check out the problems in the textbook or the practice tests in the back.
- Don't cheat.

Chapter 1

1. Fractions
2. Distribution and Factoring
3. Solving equations for one variable
4. Solving systems of equations for multiple variables
5. Basic exponent rules
6. Order of operations
7. Substitution
8. Converting fractions to percentages and vice versa
9. Functions and inverse functions
10. Basic geometry formulas and Pythagorean's Theorem

Practice Problem:
Use substitution to show that the following equality is FALSE. In other words, show that by substituting an appropriate number for x, the following two fractions are not equal.

$$\frac{5+x^2}{3x} = \frac{5+x}{3}$$

This is a common mistake in 34A when trying to simplify an answer.

Practice Problem:
Simplify: $\dfrac{x^2-4}{x^2+3x+2}$

Practice Problem:
Simplify: $\left(\left(\frac{1}{4}-\frac{1}{5}\right) \times \left(\frac{1}{4}\right)^{-1}\right)^{-2}$

Practice Problem:
Solve for x in terms of y:

$$\frac{x+3}{2} + y = 2$$

Practice Problem:
Solve for x:

$$\frac{ax+2}{2x+3} = 2$$

Practice Problem:
Solve the following system of equations for x and y:

$$x + 5y = a$$
$$2x + 3y = 3$$

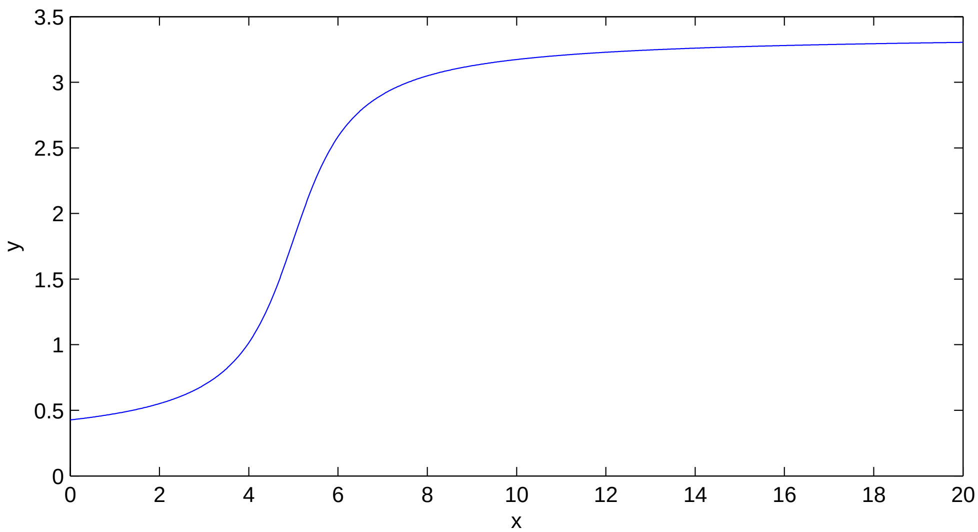
Practice Problem:
What is x% of 7 as a percentage of 31?

Practice Problem:
Find the inverse to the function $f(x) = 1 + \dfrac{7}{x^3 - 2}$.

Chapter 2

1. Reading the graph of a function (and getting info about its inverse)
2. Finding information about speed from a graph of position
3. Finding information about change in position from a graph of speed

Practice Problem:
Suppose this is the graph of $f(x)$.



- What is $f^{-1}(1)$?
- Is $f(x)$ increasing more rapidly when $x = 5$ or $x = 10$?

Chapter 3

1. Word problems

Chapter 4

1. Unit conversions (know time and metric conversions)
2. How area and volume grow with respect to linear dimensions

Practice Problem:
A salt water solution is being poured into a tank at a rate of 5 L / minute. The concentration of salt in this solution is 2 mg / cm^3. How many hours will it take until there are 60 grams of salt in the tank? Note that 1 L = 1000 cm^3.

Practice Problem:
Using just the facts that 1 L = 1000 cm^3 and 100 cm = 1 m, figure out how many liters are in 1 m^3.

Practice Problem:
Suppose a storage facility offers storage pods of two different sizes. If the larger storage pods have four times the linear dimensions of the smaller storage pods, how much more could we store in the larger pods?

Chapter 5

1. Percent error
2. Limits
3. Change in $f(x)$
4. Summation notation

Practice Problem:
You guess that for $\frac{2}{3}$ of the days in June, the skies have been overcast, but it turns out that $\frac{3}{4}$ of the days the skies have been overcast. What is your percent error?

Practice Problem:
What is $\lim_{x\to\infty} \dfrac{5-3x^3}{7-2x^3}$? What is $\lim_{x\to 0} \dfrac{5-3x^3}{7-2x^3}$?

Practice Problem:
What is $\lim_{h\to 0} \dfrac{(4+h)^2-16}{h}$?

Practice Problem:
What is the change in $f(x) = 2^x$ as x increases from 0 to 4?

Practice Problem:
Evaluate $\sum_{n=1}^{3} \left(\sum_{m=2}^{4} \dfrac{n}{m} \right)$.

Practice Problem:
Combine the following summations into a single sum:
$\sum_{n=1}^{45} a_n + \sum_{m=46}^{100} a_m - \sum_{k=1}^{55} a_k$

Chapter 6

1. Lines
2. Proportionality
3. Linear interpolation / extrapolation

Practice Problem:
What is the line that passes through (2,3) and hits the x-axis at 7?

Practice Problem:
Suppose the time it takes Maggie to drive across the country is inversely proportional to her average driving speed and proportional to the number of times she stops to rest. Maggie drives across the country in 6 days, her average speed is 80 mph and she stops 4 times. How fast would Maggie have had to drive if she wanted to take 10 days and stop only 5 times?

Practice Problem:
Let $f(x) = 3^x$. Use the points given by $x = 1$ and $x = 2$ and linear interpolation to estimate $3^{1.5}$.