Calculus 120, sections 0.3–0.6 Stuff You Need to Know

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Notes for each Lecture have been posted on my Math Department website, www2.math.umd.edu/~tjp. (Click on the link for Math 120.) Print out and/or download each of these and bring it with you to class. In this way you can put your attention on listening and thinking, and only need to write all those little "extras" that will come up during my presentation. Need I tell you that these notes will be an outline only, and that they cannot replace your presence in the lecture?

Be sure to attend the discussions on a regular basis, too. You'll find them to be valuable in cementing the topics covered in the lecture. You'll get the most out of the discussion if you do the assigned homework *before* the discussion, and *participate* in all the discussion activities.

To help you get up to speed for Math 120, we're going to spend this first class going over some things I assume you already know, but about which you may need a little reminder. The assigned practice exercises are from the Chapter 0 Supplementary Exercises. I leave it to you to go back on your own to topics and exercises on which you personally need some more review. Also, go to the Math Dept. Testbank (http://db.math.umd.edu/testbank/) and get some final exams from recent semesters of Math 113. You need to know how to do all of these questions.

Include a review of adding & subtracting and multiplying & dividing fractions and decimals. Computations on tests will involve only fairly easy numbers, and an exact answer will be required rather than a decimal approximation.

Example A (evaluating functions): Given $f(x) = x^2 - x + 1$, find $f\left(-\frac{1}{3}\right)$. *Answer*: $\frac{13}{9}$

I suggest you first rewrite the formula using parentheses to create blank spaces which you then fill in.

You'll also need to know how to graph functions both by hand and with a calculator, as well as be able to read and interpret graphs. Using shifts and translations will come into play.

Example B (domain and range): Given $g(x) = \sqrt{3 - x} + 4$ state the domain and range. *Answers*: $x \le 3$; $y \ge 4$

We'll be doing a good bit with linear functions. We'll review these extensively in our investigation of slope in section 1.1.

Example C (quadratic functions): Find the vertex, *y*-intercept, and any *x*-intercepts of $f(x) = x^2 - x + 1$.

Answers: $\left(\frac{1}{2}, \frac{3}{4}\right)$, (0, 1), none

Example D: Find the vertex, *y*-intercept, and any *x*-intercepts of $h(x) = 2x^2 - 5x - 3$.
Answers: $\left(\frac{5}{4}, -\frac{49}{8}\right)$; $(0, -3)$; $\left(-\frac{1}{2}, 0\right)$ & (3, 0)

Example E (zeroes of functions): Find the zeroes of $h(x) = 2x^3 - 5x^2 - 3x$. *Answers*: 0, $-\frac{1}{2}$ and 3

Note the connections among factors (which are formulae or equations), *x*-intercepts (which are points), and zeroes (which are numbers or values).
You'll also need to be familiar with polynomial functions, rational functions, and asymptotes for chapter 2.

Example F (composition of functions): Given $f(x) = x^2 - x + 1$ and $m(x) = x - 2$, find $(f \circ m)(x)$.
Answer: $x^2 - 5x + 7$

Composition of functions becomes extremely important beginning in chapter 3.

Example G: Given $f(x) = x^2 - x + 1$, evaluate the difference quotient $\frac{f(x+h) - f(x)}{h}$. *Answer*: $2x + h - 1$

Example H (exponent properties): Simplify $\frac{2x^2(2x)^2}{\left(\sqrt{x}\right)^3}$. *Answer*: $8x^2\sqrt{x}$

You'll also need to be familiar with exponential functions, logarithm functions, and logarithm properties for chapter 4.

Example I: If you deposit $200 into an account paying 3% annual interest compounded quarterly, how much will you have in the account after 5 years? *Answer*: $200(1.0075)^{20}$ (exact), $232.24 (approximate)

Other applications we'll run across are the infamous corral problem, as well as questions about a ball thrown upward from a given height with an initial velocity.

Example J: A corral with two adjacent pens and a shared side uses 73 yards of fencing, and has an area of 220 yd^2. What are the dimensions? *answers*: either $\frac{40}{3}$ yd by $\frac{33}{2}$ yd or 11 yd by 20 yd.