First Posting: Sun Nov 13 15:16:27 MST 2005

Update list: Wed Nov 16 12:08:38 MST 2005

Thu Nov 17 10:32:46 MST 2005 /m143.fa05/handouts143/t3_143_B18/review_suggestions_3_tex

1 This list is not in final form. Like, stuff may yet be added to it.

2 Test #3 is

Friday
11/18/05

3 There will be a with-calculator part of this exam. So have some batteries in your calculator. And bring it to the test.

Compound interest, anyone?

4 The test will cover the material of Assignments #29 – #37 roughly. It will also cover exponential-function even though we will not have had homework on them (check out the recommended problems for assignment #37).

5 Be sure you can do the following:

(a) Complex-number arithmetic: divide, multiply, add, subtract, conjugate. Also products of polynomials with complex coefficients.

(b) Use complex numbers to factor the *sum* of two perfect squares.

(c) Use the quadratic formula to find complex zeros.

(d) Given a polynomial with integer coefficients, be able to cook up the famous **Rational-Zero-Candidtate List**.

(e) Be fluent at **synthetic division**.

(f) Find and use the **reduced polynomial**.

(g) It's handy to know about the famous upper-bound criterion.

(h) Relate the graph of $\boldsymbol{f^{-1}}$ to the graph of $\boldsymbol{f}$.

(i) Given a formula for $\boldsymbol{f(x)}$, find a formula for $\boldsymbol{f^{-1}(x)}$:

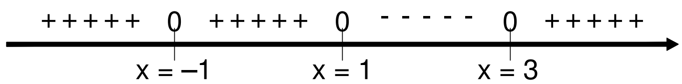
(i) $\boldsymbol{g(x) = 2 + \frac{3}{x+5}}$ has $\boldsymbol{g^{-1}(x) = \frac{-5x+13}{x-2}}$ Corrected.

(ii) If $\boldsymbol{G}$ is a function with an inverse, and $\boldsymbol{f(x) = 3 - 2G(5-4x)}$, then, in terms of $\boldsymbol{G^{-1}}$, $\boldsymbol{f^{-1}(x) = \frac{5}{4} - \frac{1}{4}G^{-1}\left(\frac{3-x}{2}\right)}$.

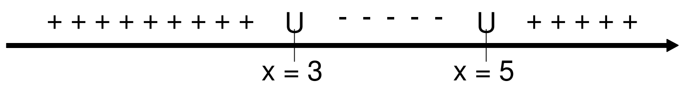
(j) Be able to graph $\boldsymbol{g(x) = 2 + \frac{3}{x+5}}$ and its inverse. Show the graph relating properly to asymptotes.

(k) In 1.7, 3.1, and 3.6 we have had to use sign-change charts to help with graphs of factored polynomials and factored rational expressions.

(i) The polynomial $\boldsymbol{P(x) = (x-3)(x-1)(x+1)^2}$ has sign chart



(ii) The rational function $\boldsymbol{R(x) = \frac{x^2 - 8x + 116}{x^2 - 8x + 15}}$ has sign chart



(l) Use of long division and factoring to graph $\boldsymbol{R(x) = \frac{x^2 - 8x + 116}{x^2 - 8x + 15}}$.

(m) Old, but still-live, business: do function substitutions correctly

(i) I believe the key to this is exemplified by finding $\boldsymbol{g(x+h)}$ for

$$\boldsymbol{g(x) = \frac{x}{x^2 - 3} - x^2}$$

by first writing

$$\boldsymbol{g(\quad) = \frac{(\quad)}{(\quad)^2 - 3} - (\quad)^2},$$

and then filling all the blanks with $\boldsymbol{x + h}$. This will set you on the right path. For this $\boldsymbol{g}$, $\boldsymbol{NQ}$ simplifies to

$$\boldsymbol{NQ = \frac{3x^2 - 3 + xh}{(x^2-3)\left[(x+h)^2 - 3\right]} - 2x - h},$$

doesn't it?

(ii) In assignment #18 we had $\boldsymbol{TI}$. A recent Statesman article mentioned $\boldsymbol{TI}$ indirectly: click here for a picture of a Master Teacher's black-board work on $\boldsymbol{TI}$, and where it comes from. Click here for the accompanying article.

(iii) The assignment-#18 answer key is posted.

(iv) On the old, 12/18/02, final exam: problems 7 and 9.

(v) On assignment #18 we had $\boldsymbol{NQ}$, $\boldsymbol{TI}$, $\boldsymbol{SYM}$, and $\boldsymbol{ANT}$. Now we have $\boldsymbol{QQ}$:

$$\boldsymbol{QQ = \frac{f(x+2h) - f(x-3h)}{5h}}.$$

If you compute and simplify QQ for the function

$$f(x) = 5 - 3x - 2x^2,$$

it simplifies to $-3 - 4x + 2h$. Not 1.

(vi) For $f(x) = 4^x$,

$$\frac{f(x+h)}{f(x-h)} = 16^h,$$

and, if we let TI_2 denote TI for $f(x) = 2^x$ and let TI_4 denote TI for $f(x) = 4^x$, then

$$\frac{TI_4}{TI_2} = 2^x(2^h + 2^{-h}).$$

(n) Draw graphs at least **25** times as big as your routine capital letters.

(o) Distinguish the equation-graph pairs, page 164, line, circle, and parabola problems. Note that we have added on the exponential-function graphs to our ever-growing page-164 list.

(p) Ungraph. That is, suss out the equation of a given graph:

(i) Problem 79, page 103

(ii) Problems 1 and 4 in the old test #1 for 9/27/02.

(iii) Check the recommended problems under assignment #37.

(q) Recognize the page-164 **Friendly-Faces List** which we enhanced with the upper half of a circle **and** with exponential-function graphs.

(r) The section-2.5 **moves** now as applied to exponential functions.

(s) Be sure you know how the graphs of f and f^{-1} are related. In section 4.2 we study a famous inverse-function pair.

(t) Be able to do the algebra to compute an inverse of a function.

6 Some common errors, aka "howlers":

(a) Getting 1 for NQ or TI when the function is not a straight line parallel to $y = x$.

(b) On assignment #29, many students have done problem 30 using the notorious *Square-Root Howler*, use of the *bogus* equations:

$$\sqrt{A+B} = \sqrt{A} + \sqrt{B} \qquad \sqrt{A-B} = \sqrt{A} - \sqrt{B}$$

to do $\sqrt{4 - x^2} = \sqrt{4} - \sqrt{x^2} = 2 - \sqrt{x^2}$, which Mama Nature does not *LIKE*.

(c) Another corporate difficulty shows up when we try to do something like evaluating $-\boldsymbol{B}$ when $\boldsymbol{B}$ is a complicated expression. Here's an example:

$$\boldsymbol{A = (3x - y)^2\,(2x + 3y)^2} \qquad\qquad \boldsymbol{B = (3x - y)^2\,(2x - 3y)^2}$$

yields $\boldsymbol{A - B = 216x^3y - 144x^2y^2 + 24xy^3}$.

(d) If $\boldsymbol{f(x) = \sqrt{9 - x^2}}$ and $\boldsymbol{g(x) = \sqrt{4 - x^2}}$, then $\boldsymbol{\big(f \circ g\big)(x) = \sqrt{5 + x^2}}$ and $\boldsymbol{\big(g \circ f\big)(x) = \sqrt{x^2 - 5}}$.

7 Old, but still-live, business: be able to

(a) **PEMDAS**: Google gets you the Elko Public Schools, and a more-advanced Purplemath discussion. This is important for correctly directing computers (check problem 2, test #1), as well doing algebra correctly.

(b) Add algebraic fractions using the *Least Common Denominator*

(c) Parse a quadratic-in-$\boldsymbol{x}$-and-$\boldsymbol{y}$ equation to see whether it's a circle.

(d) Add algebraic fractions using the *Least Common Denominator*

(e) Decode **negative exponents** in expressions.

(f) Decode **fractional exponents** in expressions.

8 Purple-page end-of-chapter problems with all the answers BOB!

(A) For Chapter 2, page 244-245: 10, 11, 12

(B) For Chapter 3, page 328: 1-7, 8(b), 9 (except for the calculator part)

(C) For Chapter 4, page 393, we aren't on the map yet.