

NAME _____

27 February 2009

MATH 124-002 — TEST II

PLEASE READ THESE INSTRUCTIONS:

Problems have varying point values, which are specified next to each problem number. Any points you earn more than 100 will count as extra credit. Move quickly through the test, but try to be as accurate as you can.

You may use a graphing calculator, but **not** a calculator (such as the *TI-89*) capable of symbolic manipulation. You may not use your book or notes.

If you want credit for an answer, you **must** *explain what you are doing* – this means explaining **each step** in your work, particularly when you are using your calculator.

PLEASE TURN OFF YOUR CELL PHONE.

[Please do not write in the boxes below:]



(from <http://www.toothpastefordinner.com>)

1 : 10	2 : 9
3 : 12	4 : 20
5 : 15	6 : 12
7 : 10	8 : 12
9 : 12	Σ : 112

- (10) **1** Find the quotient and remainder when we do the division

$$\frac{2x^3 - 7x^2 + 5}{x - 3}$$

- (3×3) **2** Perform the indicated operation and express the result in the form $a + bi$:

(a) $(6 + 5i)(2 - 3i)$ (b) $\frac{25}{4 - 3i}$ (c) $\sqrt{\frac{1}{3}} \cdot \sqrt{-27}$

- (12) **3** Write down a polynomial of degree 3 with (real!) integer coefficients having zeros 2 and i .

(20) 4 Factor the polynomial

$$P(X) = x^4 - 3x^3 + 6x^2 - 12x + 8$$

as completely as you can into factors with only **real** coefficients. Then give the complete factorization into linear factors with **complex** coefficients.

- (15) **5** Graph and find all asymptotes and intercepts of the function

$$r(x) = \frac{x^2 + 5x + 4}{x - 3}$$

- (4×3) **6** Evaluate each of the following without using a calculator (so, with perfect precision):

(a) $\log_6 \log_2 64$

(b) $5^{\log_5 x^3}$

(c) $7^{2 \log_7 5}$

(d) $\log_8 128 - \log_8 2$

- (2×5) **7** Sketch graphs of the following two functions (making sure to put some numbers on the axes) and determine their asymptotes, domains and ranges.
- (a) $f(x) = \log_2 x$ and (b) $g(x) = 4 - e^{-3x}$

(3×4) **8** Solve each of these equations for x :

(a) $7^{x/2} = 5^{1-x}$

(b) $\log x + \log(x - 3) = 1$

(c) $2^{2/\log_5 x} = \frac{1}{16}$

(3×4) **9** The graph shows the population of a rare species of bird, where t represents the years since 1999 and $n(t)$ is measured in thousands.

(a) Find a function of the form $n(t) = n_0 e^{rt}$ which models the bird population at time t .

(b) What is the bird population expected to be in the year 2010?

(c) In what year is the bird population expected to be 10000?