

MAP 103 Spring 2008 Exam 2 Review Information

Test format:

- There are 9 questions, a few with multiple parts. Each question or part of a question is worth 6 or 7 points apiece, for a total of 105 points. 100 points will be considered a perfect score.
- 95 points of the test will consist of “standard exercises”, meaning problems very similar to those you have solved in class and in homework, thus affording you an excellent chance of doing quite well on the exam simply by studying the types of problems covered in class and in homework.
- 10 points of the test will be more challenging and may ask you to put ideas together or synthesize a tiny bit of mathematics on your own.
- You should complete the questions you know how to do first and then go back and complete others that are more challenging for you.
- You should complete (or know how to solve) all review problems listed below. Many of the exam problems will be similar to these review problems and all of the concepts tested on the exam will be revisited in these problems. You should not only understand how to complete the problems below but should also understand the concepts underlying their solutions.
- There will be review sessions announced on the course webpage.

Problems:

1. Graph the following piecewise function:

$$f(x) = \begin{cases} x - 1 & \text{if } x < 1 \\ 4 & \text{if } 1 \leq x < 3 \\ -x + 4 & \text{if } x \geq 3 \end{cases}$$

2. Rewrite the function $g(x) = |3 - x|$ as a piecewise function with two rules. Each rule should be a first-degree polynomial.
3. Find $h(0)$, $h(5)$, $h(-3)$, and $h(k - 3)$ if $k - 3 < -2$ if

$$h(x) = \begin{cases} -x^2 + 3x - 1 & \text{if } x < -1 \\ 3 - x^3 & \text{if } -1 \leq x \leq 2 \\ \sqrt{x} & \text{if } x > 2 \end{cases}$$

4. Subtract $1 - 5xy + 3xy^2 - 4y$ from $-2xy + 5xy^2 + 3y$.
5. Write the area of a rectangle as a fourth-degree polynomial if its length is given by $x^2 + x + 2$ and its width is given by $2x^2 - 3x + 1$.
6. Expand completely: $(x + h)^3$.

7. Divide $x^3 - 4x^2 + 2x - 1$ by $x^2 + 1$. Clearly identify the quotient and remainder.
8. Divide: $\frac{20x^3 - 8x^2 + 5x - 5}{5x - 2}$
9. Factor the following polynomials completely:
- (a) $16x^4 - 81y^4$
 - (b) $9x^2y - 9xy + 2y$
 - (c) $2a^2(y + 1) + a(y + 1) - 6(y + 1)$
 - (d) $12y^6 + 23y^3 + 10$
 - (e) $7g^2 - 12gh - 4h^2$
 - (f) $x^2 + 16x - 80$
 - (g) $15x^2 - 91x + 6$
 - (h) $2x^5 + 16x^2y^3$
 - (i) $5xy^2 - 9xy + 4x$
 - (j) $x^2 + 6xy + 8y^2$
 - (k) $(3r + 6)^2 - 12(3r + 6) - 28$
 - (l) $3x^2y^3 + 6x^2y^2 - 45x^2y$
 - (m) $3x^{2n} - 8x^n + 4$ (Assume $n \in \mathbb{N}$. This is challenging.)
10. Find all solutions to each equation below:
- (a) $-2t^3 = 108t - 30t^2$
 - (b) $y^3 + 4y^2 = 9y + 36$
 - (c) $2z(z + 6) = 2z^2 + 12z - 8$
 - (d) $2x^3 + 5x^2 = 8x + 20$
 - (e) $(x + 2)(x - 2) = 5(x + 4)$
 - (f) $b - (3 + 2b) = 2b - 7(1 - b)$
 - (g) $(x^2 + x - 6)(3x^2 - 14x - 5) = 0$
 - (h) $x^3 - 18x = 3x^2$
11. You are so disgusted with MAP 103 that you climb to the top of the math building and you throw your textbook up into the air and off the building. Of course, since this is a math problem, we can model the height h (in feet) of the book as a function of time t (in seconds) after you threw the book into the air as $h(t) = -16t^2 + 64t + 960$.
- (a) Find the height of the object at $t = 0$ seconds, $t = 3$ seconds, $t = 6$ seconds, and $t = 9$ seconds.
 - (b) You watch the book hit the ground. You then immediately realize that throwing the book off of the building was not such a good idea, and you climb down the building to retrieve the book. It takes you 30 seconds to climb down to the ground and reach the book. How much time has elapsed from the time you threw the book in the air until the time you retrieved the book?

12. If the width of a rectangular plot of land is four less than twice the length and the area of the rectangular plot is 96 square miles, find the dimensions of the plot of land.