College Algebra & Precalculus — Midterm Study Guide
Exam Date: Thursday June 12, 12:30-2:55

The following is a list of topics that we will have covered over the first three weeks of the course. It is not necessarily a complete list, but I believe it does hit all of the points that I stressed most in class. Accompanying each topic on the list are the sections where it was introduced and at least one problem that embodies the spirit of that topic. I chose these problems to help you test your conceptual understanding of the topic.

The best way to study for this exam is to review your notes and to do lots of problems. Make sure you understand any difficulties you’ve had on the homework as well. Melanie will hold her usual hours on Wednesday 3-5, and I will have my usual office hours on Thursday 11:30-12:30. — Xander

• Functions (§2.1, 2.3)
  – Domain and Range
    p.234 #9
  – Vertical Line Test
    p.234 #4
  – Average rate of change / Increasing and Decreasing Behavior
    p.235 #41
* Graphs of standard functions(§2.2)
  p.234 #15, 21, 31
• Transformations of graphs and symmetry (§2.4)
  p.235 #47 – 50
• Quadratic Functions (§2.5)
  – Graphing
    p.234 #19
  * Maximum and minimum values
    p.235 #54
• Combining functions (§2.7)
  p.236 #63
• One-to-one functions (§2.8)
  – Is it a 1-1 function? p.236 #70
  – Horizontal line test p.234 #4
  – Inverse functions p.236 #79
• Polynomial functions (§3.1-3.3, 3.5)
  * Finding roots, factoring, and long division p.317 #31(a), 33(a), 53 (factor too)
    – End behavior
  * Graphing p.317 #31(b), 33(b)
• Rational functions (§3.6)
  – Horizontal and vertical asymptotes
  * Graphing p.318 #67, 68
• Complex numbers (§3.4)
  – Basic operations p.318 #37-46
• Exponential and Logarithmic functions (§4.1-4.4)
  – Domain and range
  – Graphs p.383 #3, 5, 11
    ⋆ Laws of logarithms and change of base formula p.383 #39, 44
    ⋆ Solving equations p.383 #59, 60, 61
  ⋆ Modeling with functions (§2.6, 4.5)
    p.236 #61
    p.384 #82, 84
  ⋆ General problem solving
    p.318 #75
    p.383 #76
    p.369 #85
Answers to even numbered problems

pp.234-236

4. (a) not a function
   (b) a function, but not one-to-one
   (c) one-to-one function
   (d) not a function

48. (a) shift right 2 units
    (b) reflect over x-axis
    (c) reflect over x-axis, then shift 3 units up
    (d) squish vertically by a factor of 1/2, then shift down 1 unit
    (e) reflect over the line \( y = x \)
    (f) reflect over the y-axis

50. (a) odd
    (b) neither
    (c) even
    (d) neither

54. 5/4

70. Not one-to-one

pp.318

38. \(-3 - 2i\)
40. \(2 + 8i\)
42. \(\frac{23}{25} + \frac{36}{25}i\)
44. \(-2 + 2i\)
46. \(-20\)

68. (See graph.) This graph has x-intercepts \((\frac{3}{2} \pm \frac{\sqrt{23}}{2}, 0)\) and y-intercept \((0, \frac{7}{4})\). It has a vertical asymptote at \(x = 4\) and a slant asymptote \(y = 2x + 2\). Notice that the graph is drawn with a different scale in order to display all of this information. (Also, the program I used to draw it likes to utilize solid lines for vertical asymptotes; remember that we have used dashed lines to represent them in class.)


pp.383-384

44. \(\log 4 + 3 \log x - 2 \log y - 5 \log(x - 1)\)

60. \(x = 3\)
76. \[ y = \frac{a}{e^a - 1} (x - 1) \]

82. (a) \[ A = 5000 \left( 1 + \frac{0.085}{2} \right)^{2.3/2} = 5000(1.045)^3 \approx 5705.83 \]

(b) \[ t = \frac{\ln(7/5)}{2 \ln(1.045)} \approx 3.822 \text{ years}. \]

84. (a) \[ t = \frac{\ln 2}{\ln(5/2)} \approx 0.756 \text{ hours} \approx 45.4 \text{ minutes}. \]

(b) 156,250 bacteria