

Math 122 (Fall '12)

# Review Questions for Final

**Note:** The following are some representative questions for the final. This list is not supposed to cover all the possible questions on the final, but it should give you an idea of what to expect. For further practice see Midterm 1 [Mid1], Midterm 2 [Mid2], Sample Midterm 1 [SMid1], Sample Midterm 2 [SMid2], Sample Final [SFinal].

## Part I - Fundamental Questions

1. You should know how to solve the following type of equations:

- i. Linear Equations:  $2(x + 3) = 5$
- ii. Quadratic Equations:  $2x^2 + 5x = 3$
- iii. Equations involving exponential functions:  $2 \cdot e^x = 3 \cdot 2^x$
- iv. Equations involving logarithms:  $2 \ln x = \ln(3x) + 5$
- v. Equations involving power functions:  $x^{100} = 2^{99} \cdot \sqrt{x^{101}}$

For further examples see [Mid1](1), [SMid1](1).

2. You should know how to compute derivatives such as

- i.  $3x^2 + 2e^x + \sqrt{x^3} + \frac{4}{x} - \ln x$  (basic rules)
- ii.  $(x^2 + 1) \ln x$  (product rule)
- iii.  $\ln(x^2 + 1)$  (chain rule)
- iv.  $\frac{x}{x^2+1}$  (quotient rule)
- v.  $e^{x \ln x} + xe^{2 \ln x + 3}$  (both chain and product rules)

For further examples see [Mid2](1), [SMid2](1), [SFinal](1) (iii, viii and x are less relevant).

3. You should know how to compute the antiderivatives of the functions such as

- i.  $3x^2 + 2e^x + \sqrt{x^3} + \frac{4}{x}$  (basic rules)
- ii.  $\frac{\sqrt{\ln x}}{x}$  (substitution)
- iii.  $x^2 e^{x^3+1}$  (substitution)
- iv.  $x(2x^2 + 3)^{100}$  (substitution)
- v.  $x^2(x^5 - x^6)$  (expand, basic rules) For further examples see [SFinal](3).

4. Questions related to the fundamental theorem of calculus

A. Compute the definite integrals

- i)  $\int_0^1 2x - e^x dx$
- ii)  $\int_1^4 x\sqrt{x^2 + 1} dx$

B. Is it true that

- i)  $\int x e^x dx = (x - 1)e^x + C$ ?
- ii)  $\int x \ln x dx = (x - 1) \ln x + C$ ?

For further examples see [SFinal](4).

**Part II** - Applications of derivatives/integrals

5. (**Derivatives**) Local Min/Max; Global Min/Max; Inflection Points/Concavity; Graph the function. See [SFinal](5), [Mid2](4), [SMid2](5), [SMid1](8), [Mid1](4).

**6. (Derivatives)** Approximations, see [SMid1](6), [Mid1](5). Tangent lines, rate of change/velocity, acceleration, etc., see [Mid2](2), [SMid2](2), [SMid2](3), [SMid2](4).

**7. (Integrals)** Estimation of the integral using Riemann Sums (see [SFInal](8)]. For instance:

- i) Estimate  $\int_0^2 x^2 dx$  using 4 division points and using
- the left end-point
  - the right end-point
  - the mid-point

Which is one is the most accurate method? Which one is clearly an underestimate? Which one is clearly an overestimate? Sketch a graph

- ii) What is a reasonable values for  $\int_1^3 f(x)$  if you are given

x	0	0.5	1	1.5	2	2.5	3	
f(x)	1	1.2	1.5	2	1.4	1.1	0.7	?

**8. (Integrals)** Compute areas (see [SFInal](7)). For instance

- i) Find the area below the graph for  $\sqrt{x}$  for  $x \in [1, 9]$ .
- ii) Find the area between the graphs of the functions  $f(x) = 2x - 1$  and  $g(x) = x^2$ .

### Part III - Miscellaneous Questions

**9.** Word Questions (e.g. [SMid2](7), [SMid1](5), [SMid1](9), [Mid2](3), [Mid1](3), “Check your understanding Section” for Ch 5: 30, 31, 33, 37, 41, 42, 43)

**10.** True/False Questions